



Environment
Canada

Environnement
Canada

www.ec.gc.ca

Population Status of Migratory Game Birds in Canada

November 2013

Canadian Wildlife Service
Waterfowl Committee

CWS Migratory Birds Regulatory Report Number 40



Canada

For more information on migratory birds, please visit Environment Canada's Migratory Birds website:
www.ec.gc.ca/nature/default.asp?lang=En&n=FDF836EF-1.

Cover Art:

The Canadian Wildlife Habitat Conservation Stamp, entitled *Break the ice*, features the Long-tailed Duck. It is a creation of the Canadian wildlife artist Claude Thivierge of St. Zotique, Quebec.

Through a special partnership with Environment Canada, Wildlife Habitat Canada receives the revenues from the sale of the Canadian Wildlife Habitat Conservation Stamp, purchased primarily by waterfowl hunters to validate their Migratory Game Bird Hunting Permits. The conservation stamp is also sold to stamp and print collectors and those interested in contributing to habitat conservation. In 2012–2013, Wildlife Habitat Canada provided 34 grants totalling more than \$1.3 million. This in turn helped leverage an additional \$9 million in partner funding for conservation projects, resulting in the conservation, restoration and enhancement of more than 1 million acres of wildlife habitat across Canada (Wildlife Habitat Canada 2013).

For more information on Wildlife Habitat Canada or the conservation stamp and print program, please call Wildlife Habitat Canada at 613-722-2090 (in the Ottawa region) or toll-free at 1-800-669-7919, or consult at www.whc.org.

Population Status of Migratory Game Birds in Canada

November 2013

Canadian Wildlife Service Waterfowl Committee

CWS Migratory Birds Regulatory Report Number 40

Authors:

This report was prepared by the Canadian Wildlife Service Waterfowl Committee. The principal author is Eric Reed of the national office of the Canadian Wildlife Service.

Correct citation for this report:

Canadian Wildlife Service Waterfowl Committee. 2013. *Population Status of Migratory Game Birds in Canada: November 2013*. CWS Migratory Birds Regulatory Report Number 40.

Comments:

Comments regarding this report, the regulation-setting process or other concerns relating to national migratory game birds should be sent to the Director of the Population Conservation and Management Division at the national office of the Canadian Wildlife Service of Environment Canada, at the following address:

351 St. Joseph Boulevard, Gatineau QC K1A 0H3

Region-specific comments should be sent to the appropriate Regional Director, Canadian Wildlife Service, Environmental Stewardship Branch, at the following addresses:

Atlantic Region: 17 Waterfowl Lane, P.O. Box 6227, Sackville NB E4L 1G6

Quebec Region: 801-1550 D'Estimauville Avenue, Québec QC G1J 0C3

Ontario Region: 4905 Dufferin Street, Toronto ON M3H 5T4

Prairie and Northern Region: Twin Atria No. 2, 4999-98 Avenue, Edmonton AB T6B 2X3

Pacific and Yukon Region: 5421 Robertson Road, R.R. #1, Delta BC V4K 3N2

This report may be downloaded from the following website:
www.ec.gc.ca/rcom-mbhr/default.asp?lang=En&n=0ea37fb2-1

Catalogue No. CW69-16/40-2013E-PDF
ISBN 978-1-100-22972-0

Information contained in this publication or product may be reproduced, in part or in whole, and by any means, for personal or public non-commercial purposes, without charge or further permission, unless otherwise specified. In so doing, please ensure the following:

- Exercise due diligence in ensuring the accuracy of the materials reproduced.
- Indicate both the complete title of the materials reproduced, as well as the author organization.
- Indicate that the reproduction is a copy of an official work that is published by the Government of Canada and that the reproduction has not been produced in affiliation with or with the endorsement of the Government of Canada.

Commercial reproduction and distribution is prohibited except with written permission from the author. For more information, please contact the Environment Canada Inquiry Centre at 1-800-668-6767 (in Canada only) or 819-997-2800 or email to enviroinfo@ec.gc.ca.

© Her Majesty the Queen in Right of Canada, represented by the Minister of the Environment, 2013

Aussi disponible en français

Table of Contents

BACKGROUND	1
POPULATION STATUS OF INLAND DUCKS	1
EASTERN CANADA	1
CANADIAN PRAIRIES AND WESTERN BOREAL CANADA.....	3
SOUTHERN YUKON	6
INTERIOR BRITISH COLUMBIA.....	6
POPULATION STATUS OF SEA DUCKS	6
EIDERS	7
HARLEQUIN DUCK	10
SCOTERS	12
BARROW'S GOLDENEYE	13
OTHER SEA DUCKS	14
POPULATION STATUS OF GEESE	14
SNOW GOOSE	14
MANAGEMENT OF OVERABUNDANT GEESE	18
<i>Conservation Issue</i>	<i>18</i>
<i>Management Response</i>	<i>19</i>
<i>Effectiveness of Special Measures</i>	<i>19</i>
<i>Notice of Intent to Consider Designation of Western Arctic Lesser Snow Geese as Overabundant</i>	<i>19</i>
<i>Notice of Intent to Consider Designation of Ross's Geese as Overabundant.....</i>	<i>20</i>
<i>Regulatory Proposal for 2013-2014</i>	<i>21</i>
ROSS'S GOOSE	21
GREATER WHITE-FRONTED GOOSE.....	22
CANADA GOOSE AND CACKLING GOOSE	23
BRANT	27
POPULATION STATUS OF SWANS.....	28
TUNDRA SWAN	28
TRUMPETER SWAN.....	29
POPULATION STATUS OF OTHER HUNTED MIGRATORY BIRDS.....	30
THICK-BILLED AND COMMON MURRES.....	30
AMERICAN WOODCOCK.....	31
MOURNING DOVE	31
WILSON'S (COMMON) SNIFE	32
SANDHILL CRANE	32
BAND-TAILED PIGEON	33
AMERICAN COOT	33
RAILS	34
LITERATURE CITED.....	35
APPENDICES	42
APPENDIX A – SPECIAL CONSERVATION MEASURES FOR FALL 2013 AND SPRING 2014	42
APPENDIX B – FIGURES	44
APPENDIX C – TABLES	92
APPENDIX D – LIST OF ACRONYMS	109

Background

Canadian hunting regulations for migratory game birds are reviewed annually by Environment Canada, with input from the provinces and territories and a range of other stakeholders. As part of this process, the Canadian Wildlife Service (CWS) of Environment Canada produces three reports each year. The first report, *Population Status of Migratory Game Birds in Canada* (commonly called the November report), contains population and other biological information on migratory game birds, and thus provides the scientific basis for management. The second report, *Proposals to Amend the Canadian Migratory Birds Regulations* (the December report), outlines the proposed changes to the annual hunting regulations, as well as proposals to amend the overabundant species regulations and other proposed amendments to the *Migratory Birds Regulations*. Proposals for hunting regulations are developed in accordance with the Objectives and Guidelines for the Establishment of National Regulations for Migratory Game Bird Hunting (www.ec.gc.ca/rcom-mbhr/default.asp?lang=En&n=6DE5A330-1). The third report, *Migratory Birds Regulations in Canada*, summarizes the hunting regulations for the upcoming hunting season. The three reports are distributed to organizations and individuals with an interest in migratory game bird conservation, to provide an opportunity for input on the development of hunting regulations in Canada.

Data presented in the *Population Status of Migratory Game Birds in Canada* report come from a variety of sources. Breeding population estimates and trends for inland ducks are derived from large-scale systematic aerial surveys conducted annually in eastern and western Canada and parts of the United States. Additional small-scale, usually annual, breeding waterfowl surveys are also conducted in other parts of this country. Information on sea duck populations comes mainly from surveys limited to a few key locations or a small portion of the species' range, and the surveys are conducted during the breeding, moulting or overwintering period. Geese population estimates and trends are derived mainly from specific annual or occasional surveys carried out during the breeding season or, in some cases, during migration. Additional information on waterfowl populations is also provided by mid-winter surveys on the wintering grounds conducted annually in the four U.S. flyways. Population information on swans and other migratory game birds is derived from specific breeding or wintering surveys or countrywide breeding bird surveys. Harvest levels of migratory game birds in Canada and the United States are estimated through national

harvest surveys and, in some cases, through species-specific surveys. From 1961 through 2001, estimates of waterfowl harvest in the U.S. were derived from the U.S. Fish and Wildlife Service's (USFWS) Waterfowl Questionnaire Survey. However, a new survey, the Harvest Information Program, was fully implemented in 1999. In addition to waterfowl, it gathers information on species and groups of migratory game birds such as woodcock, doves and snipe. Harvest estimates yielded by the two surveys cannot be directly compared.

Population Status of Inland Ducks

Eastern Canada

In Eastern Canada, breeding waterfowl populations are monitored annually through the Eastern Waterfowl Breeding Ground Survey (hereafter referred to as the Eastern Waterfowl Survey). The CWS carries out a systematic helicopter survey over the Boreal Shield region from northeastern Ontario to Newfoundland and Labrador, and the Atlantic Highlands region from the Gaspé Peninsula in Quebec to Nova Scotia. The USFWS conducts a fixed-wing aerial survey in parts of eastern Canada and the northeastern U.S. (Figure 1). This work has been evolving since 1990, originating as part of the Black Duck Joint Venture of the North American Waterfowl Management Plan (NAWMP). The surveys are designed and timed primarily to provide reliable breeding population estimates and trends for the American Black Duck, an early nesting species.

Historically, the data from these surveys (CWS and USFWS) have been analyzed separately, despite some overlap in geographic coverage. In 2004, the CWS and the USFWS agreed to integrate the two surveys to reduce the extent of overlap and expand the geographic region covered. The data presented in this report represent an integration of the results of the two survey platforms. In time, all survey results will be integrated for reporting on a regional basis. Technical issues grounded some of the USFWS aircraft during the 2013 breeding waterfowl survey period such that several strata were covered only by CWS crews using helicopters. The integrated survey approach ensures that this year's results are consistent with those of previous years.

Additional breeding population surveys are also conducted in some parts of eastern Canada, although they are presently not included in the integrated Eastern Waterfowl Survey.

In southern Ontario, a breeding waterfowl survey of ground plots was conducted by the CWS at three-

to five-year intervals from 1971 to 2004. In 2005 it was changed to an annual survey employing a rotating sample of the original plots.

In southern Quebec, beginning in 2004, helicopter surveys along the St. Lawrence River shoreline (106 10 km × 1 km transects randomly distributed in the fluvial, the estuary and the gulf sections) and in the lowlands (100 2 km × 2 km plots systematically distributed in the Abitibi, the Lake St. Jean and the St. Lawrence plain regions) were added to assess the value of these areas to breeding waterfowl on a regular basis. Due to budget constraints, the St. Lawrence shoreline survey was discontinued in 2010. A statistical analysis of the lowlands survey in 2011 revealed that the level of precision was insufficient. Therefore, in 2012, the Abitibi and Lake St. Jean survey areas were dropped, and sampling effort was increased in the St. Lawrence lowlands to increase precision. The St. Lawrence lowlands is the region of Quebec facing the greatest pressures related to habitats and waterfowl populations, among which Black Duck and Mallard populations need to be particularly closely monitored.

An aerial survey program to assess waterfowl breeding in agricultural landscapes in New Brunswick and Nova Scotia was initiated in 2008. This program is supported by the Eastern Habitat Joint Venture and was expanded from 2009 to 2012 to include agricultural land on Prince Edward Island. Although not fully integrated into the Eastern Waterfowl Survey analysis, data from these surveys are providing resource managers with insight on the relative value of these areas to breeding waterfowl in the region. Surveys in 2013 were restricted to those plots located on Prince Edward Island that provide five years of information for surveyed landscapes in the target area. Additional analysis of these data is pending to determine the fate of this survey program in the future.

In this section, we summarize information on inland duck populations in Eastern Canada.

American Black Duck

There has been some concern over the American Black Duck (*Anas rubripes*) population of North America over recent decades, but today, the population has stabilized.

Mid-winter inventories in the Atlantic and Mississippi flyways showed a decline in the continental population between 1955 and the early 1980s, when numbers began stabilizing at a low level (Figure 2). The total number of Black Ducks counted in both flyways combined in winter 2013 (225 034) was 9% lower than the 2012 count (246 334) and is 1% above the 2002–2011 average (223 855). In 2013, the estimated population of

Black Ducks in the Atlantic Flyway was 208 195, while in the Mississippi Flyway it was 16 839 (Klimstra and Padding 2013). Surveys of American Black Ducks in their wintering areas are useful for studying overall population trends, but they are not effective for evaluating the status of breeding populations, because of the mixing of birds from diverse breeding areas. In the area covered by the Eastern Waterfowl Survey, the integrated index of the number of indicated breeding American Black Ducks is shown in Figure 3.

The 2013 Eastern Waterfowl Survey estimate was 621 800 Black Ducks, which was 3% higher than the 2012 estimate (602 000) and similar to the 10-year (2002–2011) average of 622 620. Trends appear to be relatively stable for most survey strata, except for the Western Boreal Shield, where the trend is declining.

The decline of American Black Ducks on their wintering grounds prompted the United States to initiate a program to reduce the harvest of the species in 1983; Canada joined the initiative in 1984. Between 1984 and 1988, the harvest in the U.S. gradually decreased, while it remained relatively stable in Canada (Table 2). In 1989 and 1990, however, Canada successfully implemented more restrictive Black Duck hunting regulations to protect local breeding populations.

The number of Black Ducks harvested in Canada was higher in 2012 (103 362) than it was in the previous year, as was the United States harvest (94 559; Table 2). This marks the second year in a row of increased Black Duck harvest in Canada. The reasons for this increase in harvest are unknown but may be related to the distribution of Black Ducks during the hunting season and an increasing trend in the number of Black Ducks wintering in Canada.

Other Inland Duck Species

Eastern Waterfowl Survey

The Eastern Waterfowl Survey of Eastern Canada (Figure 1), though primarily designed to survey Black Ducks, provides quantitative information on other inland duck species that can be used to evaluate the status of their breeding populations. The range-wide integrated indices for the number of indicated breeding birds of the most abundant eastern dabbling and diving duck species are plotted in Figures 4a to 4c.

Mallard

The estimated abundance of Mallards (*Anas platyrhynchos*) in the Eastern Survey Area increased by 23% in 2013 compared to the 2012 estimate (Figure 4a). Overall, Mallards continue to exhibit

increasing trends in all the regions covered by the Eastern Waterfowl Survey, with the highest rate of increase in the Atlantic Highlands.

American Green-winged Teal

The estimated abundance of Green-winged Teal (*Anas crecca*) in the Eastern Survey Area increased by 12% in 2013 compared to the 2012 estimate (Figure 4b). American Green-winged Teal showed an increase in 2013 in the Atlantic Highlands, and Eastern and Western Boreal Shield regions and was stable in the Central Boreal Shield region. Overall, Green-winged Teal continues to exhibit stable trends, but with the Atlantic Highlands showing an increasing trend.

Ring-necked Duck

The estimated abundance of Ring-necked Duck (*Aythya collaris*) in the Eastern Waterfowl Survey Area increased by 25% in 2013 compared to the 2012 estimate and was the second highest total since 1990 (Figure 4c). Overall, Ring-necked Duck continues to do well in the four regions covered by the survey.

Southern Quebec Waterfowl Survey

Since 2012, only the St. Lawrence lowlands are surveyed by helicopter (the Abitibi and Lake Saint-Jean plain regions have been dropped since 2011 to re-allocate sampling effort in the St. Lawrence Lowlands). Results for the 6 most abundant species are shown in Table 1b. The Mallard is by far the most abundant species in the St. Lawrence lowlands, with the 2013 estimate reaching 18 800 indicated breeding pairs. The species has experienced a low increasing long-term trend of 2.3% per year since 2004. The 2013 American Black Duck estimate reached 7600 pairs, with the species showing a stable trend (0.2% per year) since 2004. Green-winged Teals, Wood Ducks, temperate-breeding Canada Geese and Ring-necked Ducks continue to do well in this part of the province, with an increasing 2004–2013 trend of 3.3%, 7.5%, 6.0% and 6.0% per year, respectively (Table 1b).

Southern Ontario Waterfowl Plot Survey

Since 2005, the Southern Ontario Waterfowl Plot Survey has been conducted annually using a rotational sampling scheme where half of the 349 plots are surveyed each year. Prior to 2005, surveys were conducted sporadically (roughly every 3 years), and all plots were surveyed in a given year. In 1981 and 1982, survey effort was split and the survey was completed over a 2-year period (1981 –

High Strata; 1982 – Low Strata). As a result, the population estimate for 1981 is determined using the combined data from 1981 and 1982 (Figures 5a, 5b, 34).

Results of the breeding waterfowl plot survey in southern Ontario are shown graphically in Figures 5a and 5b for the more common duck species encountered. Trend estimates are presented for the 2003–2013 and 1971–2013 periods (Table 1a). Among the dabbling ducks, Blue-winged Teal has exhibited a long-term declining trend (-5.9% annually), with the recent trend (2003–2013) also continuing to show a strong decline (-13.1%). Similarly, the population of American Black Duck shows a slight decreasing long-term trend (-1.2%) and a higher declining trend since 2003 (Table 1a; Figure 5a). The breeding population of Mallard, the most abundant duck species in southern Ontario, has increased slightly since 1981–1982; in 2013, there were approximately 148 000 breeding pairs of Mallards in southern Ontario. Wood Ducks have demonstrated a steady increase since 1971 (3.8% annually; Table 1a) and are the second-most-abundant duck species in this area. For diving ducks, all species demonstrate long-term increases in their breeding population (Figure 5b). Results for Common and Hooded Mergansers show that the breeding populations have stabilized since 2003 (Table 1a). Population estimates for Ring-necked Duck also show a positive trend over the long and short term (Table 1a). Annual population estimates for some species, such as the Blue-winged Teal, Green-winged Teal and Ring-necked Duck, can be highly variable. For teal, this is related mainly to their general low abundance within the survey area. For Ring-necked Ducks, a later-nesting species, annual estimates may be influenced by the presence of large numbers of migrating birds in some years.

Canadian Prairies and Western Boreal Canada

Breeding waterfowl populations are monitored annually through the Waterfowl Breeding Population and Habitat Survey (WBPHS) of Western Canada (U.S. Department of the Interior and Environment Canada 1987). The traditional survey area encompasses the Canadian Prairies and Western Boreal Canada (northwestern Ontario to Old Crow Flats in the Yukon), as well as the north-central United States (U.S. Prairies) and parts of Alaska (Figure 6). The USFWS and CWS have been conducting this survey, using fixed-wing aircraft in combination with ground counts, since 1955. Breeding population estimates have been corrected for visibility bias since 1961.

Breeding Habitat Conditions in the Prairie Pothole Region

In the Prairie Pothole Region (Canadian and U.S. Prairies), weather has a strong influence on waterfowl breeding habitat conditions and, consequently, on the abundance of waterfowl populations. Droughts create difficult breeding conditions for ducks. Since 1961, spring habitat conditions have been measured by the number of ponds in May (Figure 7). In 2013, the total pond estimate (Prairie Canada and U.S. combined) was 6.9 ± 0.2 million ponds. This was 24% above the 2012 estimate, and 35% above the long-term average of 5.1 ± 0.03 million ponds (USFWS 2013). The 2013 estimate of ponds in the Canadian Prairies was 4.6 ± 0.2 million ponds. This was a 17% increase from last year's estimate (3.9 ± 0.1 million; Figure 7). An analysis of trends showed significant increases ($p < 0.05$) in the number of ponds in the Canadian Prairie Pothole Region during the last 10 years (2004–2013; Table 3).

Mallard

The Mallard (*Anas platyrhynchos*) breeding population in the traditional survey area had recovered from the decline seen in the 1980s, but in 2001 it dropped below the NAWMP goal of 8.2 million (Figure 8), and remained below it until 2006. Between 2007 and 2009, the Mallard breeding population index in the traditional survey area oscillated around the NAWMP goal. In 2013, the Mallard breeding population index was 10.37 ± 0.36 million birds, which was similar to the 2012 estimate of 10.60 ± 0.32 million birds and 26% above the NAWMP goal. There are significant positive 5-year and 10-year trends in the traditional survey area (Table 3).

The 2013 Canadian Prairie breeding population index (4.16 ± 0.16 million) was similar to the 2012 estimate (4.16 million), and slightly below the NAWMP goal of 4.37 million birds for the region (Figure 8). In Western Boreal Canada, the Mallard breeding population index was 5% lower compared to the previous year, with an estimated 2.46 ± 0.26 million birds (Figure 8). There are significant positive 10-year trends in Western Boreal Canada as well as significant increasing 5-year and 10-year trends in the Canadian Prairies (Table 3).

The continental harvest of Mallards during the last several years increased considerably compared to the late 1980s and early 1990s (Table 4), reflecting the large growth in this population. This increase in harvest has occurred entirely in the U.S., whereas harvest levels have stabilized in Canada. In 2012, it was estimated that 3.96 million Mallards were killed in the U.S., 11% less than the previous

year (4.17 million). In 2012 in Canada, the estimated harvest was 528 334 birds killed, a decrease of 4% from 2011 (509 889). Overall, the continental harvest of Mallards in 2012 decreased to 4.46 million birds, 10% less than the previous year (Table 4).

Northern Pintail

Following the dramatic decline in abundance in the 1980s and early 1990s, the breeding population of Northern Pintail (*Anas acuta*) in the traditional survey area showed signs of recovery in the late 1990s, increasing to 3.6 million birds by 1997 (Figure 9). Thereafter, pintail numbers again declined, reaching an historic low in 2002. Since 2003, the population has increased, reaching 4.43 million in 2011. In 2013, the population estimate was 3.33 ± 0.19 million birds. However, the population remains below the NAWMP goal of 5.56 million (Figure 9). Table 3 shows that the population is experiencing a significant increase in the traditional area survey over the past 10 years; however, the population still shows a significant long-term decline.

The 2013 breeding population in the Canadian Prairies was estimated at $1\,228\,255 \pm 82\,398$ birds, which represents a 25% increase over the 2012 estimate of 984 331. The habitat conditions were again very good in 2012, with a very high number of ponds. The Canadian Prairies population still remains below the NAWMP population goal of 3.30 million. In 2013, Northern Pintail numbers increased by 135% and to $264\,785 \pm 38\,537$ birds in the Western Boreal Region (Figure 9). This population remains below the NAWMP goal of 407 000 pintails. In both the Western Boreal and Canadian Prairies Regions, the population shows a significant long-term decline although the Canadian Prairies show a short-term increase (Table 3).

The total annual harvest of Northern Pintails dropped with the population decline that began in the 1980s. The continental harvest gradually rose during the mid-1990s (Table 5), reflecting the increase in estimated pintail numbers during the same period. After a reduction in harvest during the 2002–2004 period, the continental harvest numbers increased again until 2011, driven by increases in U.S. harvest. In 2012 the estimated continental harvest declined by 16% (725 287 birds killed), with declines noted in both Canada (41 841) and the U.S. (683 446; Table 5).

Other Dabbling Ducks

Other dabbling duck species monitored under the WBPBS are Blue-winged Teal (*Anas discors*), Gadwall (*A. strepera*), Green-winged Teal (*A. crecca*), American Wigeon (*A. americana*) and

Northern Shoveler (*A. clypeata*). The continental abundance decreased slightly in 2013 relative to 2012 for all these species except American Wigeon (Figures 10 to 14). All species but the American Wigeon show significant positive 10-year and long-term trends (Table 3); the long-term trend for the American Wigeon is declining, but not significantly. There were increases in the 2013 population estimates for Blue-winged Teal, Gadwall and American Wigeon in the Canadian Prairies, and slight decreases for Green-winged Teal and Northern Shoveler (Figures 10 to 14).

Of these five species, only American Wigeon is currently below its NAWMP population goal in the traditional survey area (Figures 10 to 14).

Scaup

Lesser Scaup (*Aythya affinis*) and Greater Scaup (*A. marila*) are not treated separately in the WBPHS because it is difficult to differentiate among them from fixed-winged aircraft. Nonetheless, Lesser Scaup is the much more abundant species (Austin et al. 1999). After six consecutive years of increase, scaup populations in the traditional survey area declined by 20% in 2013 (4.17 ± 0.25 million birds) and are now 43% below the NAWMP goal of 6.3 million.

The scaup population size in Western Boreal Canada accounts for nearly two-thirds of the continental total. At 2.72 ± 0.23 million birds estimated in 2013, the number of scaup in Western Boreal Canada remains well below the NAWMP population goal of 4.3 million birds (Table 3). The Western Boreal breeding population showed a significant 10-year increasing trend, but also a significant long-term decline (Table 3). In 2013, the Canadian Prairie breeding population was estimated at $663\,618 \pm 70\,238$ birds, a 28% decline compared to the 2012 estimate. Although this regional population shows a significant 10-year increasing trend (Table 3), it remains well below the NAWMP goal of 1.05 million.

The harvest of Lesser and Greater Scaup has declined considerably in Canada over time (Tables 6 and 7). In 2012, the Canadian harvest of Lesser and Greater Scaup was estimated at 29 889 and 6387 birds, respectively, which in both cases represents an increase from 2011 (42% and 15%, respectively).

The scaup harvest has been quite variable in the U.S. (Tables 6 and 7). In 2012, the Lesser Scaup harvest was the highest reported since 1979 at 634 280 birds, which represented an increase of 179% compared to 2011. The Greater Scaup harvest has also been variable over the years in the U.S. The estimated harvest was 77 512 birds in 2012 (30% higher than in 2011). The large increase in harvest in the U.S. in 2013 coincided with a

liberalization of the harvest regulations (daily bag limits went from 2–3 scaup in 2011 to 4–7 in 2012). However, the harvest under these liberal regulations was not expected to be as high as it was. USFWS biologists speculate that this great increase in scaup harvest was due to high hunter effort and high availability of scaup. They suspect that many hunters decided to expend more effort on hunting scaup as a result of the increased bag limit. They also think that 2012–2013 was one of those seasons when the scaup winter distribution was more coastal, which would make them more available to hunters (Kristi Wilkins, USFWS, pers. comm.). The 2013 harvest regulations are back to a moderate package (i.e. daily bag limit of 2–3 scaup).

The continental harvest of Lesser Scaup was the second highest on record at 664 169 birds in 2012, an increase of 167% from 2011. Similarly, the continental harvest of Greater Scaup was up by 29% to 83 899 birds in 2012.

Other Diving Ducks

The other diving duck species monitored as part of the WBPHS are the Canvasback (*Aythya valisineria*), Redhead (*A. americana*), Ring-necked Duck (*A. collaris*) and Ruddy Duck (*Oxyura jamaicensis*).

The breeding population of Canvasbacks in the Canadian Prairies has recovered somewhat from the population decline seen during the 1980s and early 1990s. The population has fluctuated widely in recent years (Figure 16). Overall in 2013, within the entire traditional survey area, Canvasback show significant increasing trends over the long and short terms, and the Canadian Prairie region also shows significant 10- and 5-year trends (Table 3). At $786\,978 \pm 57\,583$ Canvasbacks in 2013, the continental population is above the NAWMP goal of 541 868 (Figure 16).

The Canadian harvest of Canvasback has been fluctuating from year to year. In 2012, the estimated harvest was 5584, a decline of 57% from 2011 (Table 8). The harvest in the U.S. also fluctuates widely from year to year; the 2012 U.S. harvest was estimated at 117 249 birds, 17% below the 2011 estimate (Table 8).

Like the Canvasback, Redhead numbers are highly variable from year to year (Figure 17). The 2013 continental count of 1.20 ± 0.10 million birds is comparable to the estimates of the past 5 years but higher than numbers estimated prior to 2006 (below 1 million, Figure 17). The population remains well above the NAWMP goal. Redheads show a significant increasing trend over the 10-year and long term periods in the traditional survey area.

The Ring-necked Duck population shows an increasing trend of 2.5% per year over the long term

for the Western Boreal and Canadian Prairies regions as well as the entire survey area (Table 3). No data were available for Ruddy Ducks in 2013. However, they have done well in recent years, with a significant increasing trend of 1.8% per year over the long term in the traditional survey area based on 2012 estimates (Figure 19).

Southern Yukon

This was the 22nd year of the Cooperative Yukon Roadside Waterfowl Breeding Population Survey. This is a ground survey aimed at waterfowl as well as other waterbirds and shorebirds. It is intended to track trends only: there is no associated population estimate. The survey consists of counts in a sample of wetlands, conducted 5 times between early May and mid-June. The 2013 survey sample consisted of approximately 285 wetlands along the southern Yukon road system. To minimize issues due to missing data, a sample of 169 wetlands was chosen from the 287 to examine trends over the past 5, 10, and 15 years as well as the entire 22-year period. For each survey, the number of indicated pairs were calculated using standard operating procedures. The numbers presented in Figures 20 and 24 are the total number of indicated pairs on these 169 wetlands from all 5 surveys each year.

The spring of 2013 (March through May) was cooler and much wetter than normal in the Yukon/Northern B.C. Mountains Climate Region. Summer (June through August) temperatures and precipitation were well above normal. These conditions, combined with above-average winter precipitation and snowpack, resulted in many breeding wetlands in southern Yukon having much higher than normal water levels during May and early June.

Total duck numbers remained the same as last year. Decreases in the number of most dabbling ducks were observed (Figure 20), while the numbers of diving ducks and sea ducks showed increases (Figure 24). The most notable changes from last year were observed for Mallard (+20%), Northern Shoveler (+20%), and Scaup spp (+28%). Long-term trends (5-, 10-, 15- and 22-year periods) were examined for the 10 major duck species counted during the Yukon survey. The only significant trends were: (1) a continued decline in Scaup spp. (primarily Lesser Scaup) over the past 10, 15 and 22 years, although the 5-year trend is stable; (2) a modest long-term (15 and 22 years) decline in American Wigeon; (3) a modest long-term (15-year trend) increase in Mallard; and (4) a modest increase (22-year period) in Gadwall. A cursory examination of the increasing Gadwall trend shows that it reflects increasing populations of this species

in the vicinity of Whitehorse, likely related to a large sewage lagoon complex constructed there in 1996. Although the sample size is small, Trumpeter Swans continue to show highly significant increases over all periods (J. Hawkings, pers. comm.).

Interior British Columbia

In general, the habitat conditions in May 2013 in the prime waterfowl areas of southern British Columbia were fair, and good in the northern portion of the province. Winter precipitation was average in the B.C. Interior during the 2012–2013 winter. However, cool and wet conditions in mid- and late April resulted in atypical snow accumulation up to the end of April, and the transition from accumulating to melting snow packs was delayed by one to two weeks in April 2013 (B.C. Water Supply and Snow Survey; <http://bcrcf.env.gov.bc.ca/bulletins/watersupply/archive.htm>).

Early May saw unseasonably warm temperatures and dry conditions that resulted in fast snowpack melting. In the southern part of the B.C. Interior, which contains the most productive waterfowl habitat in the province, wetland water levels were marginally lower than last year and below long-term average. Conversely, northern Interior wetlands had higher and near-average water levels.

Aerial surveys of breeding waterfowl have been conducted in the Central Interior Plateau of B.C. annually since 2006, over an area in excess of 10 million hectares. The survey used a strip-transect total count method similar to the one used for the mid-continent breeding waterfowl survey, although all waterfowl sightings are geo-referenced and associated with a unique habitat type (i.e., stream, wetland, river, lake, agricultural field) and ecological unit (ecosection) to allow for the subsequent determination of ecosystem-specific, habitat-to-species relationships and the development of landscape use models. Using the USFWS formula to estimate breeding waterfowl abundance, the duck population of the Central Plateau was estimated at 305 310 birds (SE = 15 975) in May 2013, with Mallards being the most abundant species (25% of the total). The overall estimate is 2% higher than the 297 964 total duck estimate for 2012 (A. Breault, pers. comm.).

Population Status of Sea Ducks

There is concern about the population status of most of the sea duck species (tribe *Mergini*) that breed in North America. There are 15 species on the continent. Because many breed at low densities in remote parts of the continent and cover a broad geographic area, it is difficult to gather adequate

information on their ecology and population dynamics. Consequently, sea ducks are poorly understood and few reliable population indices or estimates of annual productivity exist for many of the species. Much of our knowledge is based on very few localized studies. Harvest levels are also poorly understood. In comparison with other waterfowl, sea ducks have low reproductive rates, which means that population maintenance is highly sensitive to adult mortality. There is therefore limited potential for quick population recovery. Because of increasing concern about the status of sea ducks, the NAWMP Committee created the Sea Duck Joint Venture (SDJV) in 1998 (see www.seaduckjv.org). The goals of the SDJV can be grouped under four broad categories: knowledge, communication, partnerships and conservation actions. The new SDJV Strategic Plan for 2014–2018 should soon be available (see www.seaduckjv.org). This plan will identify information needs for sea ducks and describe general strategies to address those needs. Harvest information is estimated through the national harvest survey programs in Canada and the U.S. However, harvest estimates are imprecise for some sea duck species due to small sample sizes.

Eiders

Common and King Eiders inhabit arctic and subarctic coastal marine habitats and have a circumpolar distribution. Their breeding ranges in Canada are extensive and cover most coastlines from the Beaufort Sea east into Coronation and Queen Maud gulfs, and north into the High Arctic islands, as well as throughout the eastern Canadian Arctic, including Hudson and James bays, and from the coast of Labrador south into New Brunswick. Eiders that breed in Canada and that winter as far north as open water persists form large aggregations in coastal areas. In the Pacific, they winter as far north as the polynyas adjacent to the Chukotka Peninsula in Russia, while in the northwest Atlantic they winter in Hudson's Bay, southwest Greenland, and from the Labrador coast south to New York. Throughout their range, there are four subspecies of Common Eiders and two populations of King Eiders. These populations are thought to be demographically distinctive, as they experience different climatic conditions and local threats.

Eiders have long been exploited for food and eiderdown, and more recently they have become the focus of outfitted hunts along the eastern seaboard of the U.S. Market hunting almost extirpated them from eastern North America by the end of the 19th century. The Migratory Birds Convention designated special protection to eiders and largely eliminated commercial hunting in North America. More recently,

commercial exploitation of eiders in Greenland has led to concern for the sustainability of eiders wintering there (Hansen 2002; Gilliland et al. 2009). Unlike any other species of migratory birds in North America, Common Eiders in some areas of eastern Canada support large commercial and subsistence harvests of eiderdown, where it provides a cash crop in areas with low employment or is used locally for insulation in Inuit parkas and supports local economies.

Industrial activity in Canada's north is likely to increase in the next decades. There is renewed interest in offshore oil and gas development in the Beaufort Sea, as well as some areas in the eastern Arctic. Marine shipping is likely to increase in the Arctic, especially in Hudson Strait. Both the Beaufort Sea and Hudson Strait have important marine resting and feeding areas used by thousands of eiders at certain times of the year. Increased human activity in these areas could negatively affect eiders through disturbance and pollution from accidental spills or chronic discharge.

The remoteness of much of their breeding and wintering ranges, the existence of several distinctive populations, and the fact that eiders do not use recognized North American flyways all have been factors that have led to inconsistent or non-existent management and monitoring programs across Canada. Clearly, Canada has a core responsibility for their management, but cooperation is needed with northern wildlife management boards, Russia, Greenland, France and the U.S.

King Eider

Western Arctic Population

The population estimates and trends for the Western Arctic King Eider are currently based on a count obtained about every 10 years during spring migration at Point Barrow, Alaska (Suydam et al. 2000, 2008). These counts indicated a 56% decline in numbers over a 20-year period, from 800 000 in 1976 to about 350 000 in 1996. Counts in 2003 and 2004 suggest the population may have stabilized, or possibly increased, since the mid-1990s ($304\,000 \pm 76\,254$ and $592\,000 \pm 172\,011$ in 2003 and 2004, respectively). Aerial transect surveys on western Victoria Island suggest that the King Eider population breeding on western Victoria Island declined by 54% between the early 1990s and 2004–2005 (Raven and Dickson 2006). The greatest decline occurred around Holman, the only community in the survey area.

Movement between nesting, moulting and wintering areas has been documented for King Eiders tagged with satellite transmitters on Victoria Island and Banks Island, Northwest Territories, and

Prudhoe Bay, Alaska. The results show the majority of western King Eiders moult and winter off the east coast of Russia or off the coast of Alaska (Dickson 2012a). The west coast of Banks Island is a primary staging area during moult migration for King Eiders that were implanted with satellite transmitters on Banks Island, Northwest Territories (Dickson 2012b). The most heavily used staging area during the spring was the southeast Beaufort Sea (Dickson 2012a). King Eiders banded in the central Arctic, in the Queen Maud Gulf, have been recovered near Alaska as well as near Greenland (R. Alisauskas, pers. comm.).

The King Eider is harvested for subsistence use in Canada, Alaska and Russia. There is some concern that local harvest in communities such as Holman, Canada, are having an impact, yet harvest data for all three countries lack the accuracy and precision needed to model effects on adult survival. Fabijan et al. (1997) estimated a harvest in Alaska and Canada of 2–5% of the population from the mid-1970s to mid-1990s. The eider harvest in Canada occurs mainly in June, with most (99%) of the harvest occurring at Holman (96% are King Eiders). Harvest data for Russia are speculative (probably numbers in the low 1000s).

Eastern Arctic Population

A review of available data on the wintering grounds in Greenland has shown a substantial decrease in the numbers of wintering and moulting King Eiders and suggests that the eastern Arctic population is declining. It is not known if this apparent decline represents a shift in distribution due to human disturbance (Suydam 2000). In the Rasmussen Lowlands of Nunavut, however, a significant decline in the numbers of King Eiders was seen between 1974–1975 and 1994–1995 (Gratto-Trevor et al. 1998). These findings support the concerns expressed by hunters in the area that numbers are declining (Johnston et al. 2000). In February 2010, CWS conducted exploratory surveys in parts of Hudson Strait and Frobisher Bay. These surveys confirmed the occurrence of large numbers of wintering King and Common Eiders at the northern tip of Labrador and southern tip of Baffin Island (S. Gilliland and C. Lepage, unpubl. data), with small numbers of birds occurring on the eastern side of Ungava Bay and in Frobisher Bay. The east coast of Baffin Island has not been explored, but anecdotal observations by helicopter pilots suggest concentrations of eiders may winter there as well (J. Innis, pers. comm.).

In the eastern Arctic, available harvest data for eiders are limited. However, the harvest of eiders (King and Common Eiders combined) in southwest Greenland is estimated at over 100 000 birds

annually. A large proportion of this harvest consists of Canadian breeding birds, since the breeding population of Common Eiders in western Greenland is likely only 20 000 pairs, based upon recent surveys (G. Gilchrist, pers. comm.). The largest eider harvests in Canada occur in Newfoundland, where about 10% of the harvest may be composed of King Eiders (Gilliland and Robertson 2009).

Pacific Common Eider

Pacific Common Eider population estimates and trends for Canada are currently based on a count obtained about every 10 years during spring migration at Point Barrow, Alaska (Suydam et al. 2000, 2008). These counts indicated a 53% decline over a 20-year period from 156 000 in 1976 to about 73 000 in 1996. More recent counts in 2003 and 2004 suggest the population has increased since the mid-1990s to over 100 000 eiders.

Surveys during spring migration in the late 1980s suggested that more than half of the Pacific Common Eiders that breed in Canada nest in Dolphin and Union Strait, Coronation Gulf, and Queen Maud Gulf. To document the size and location of nesting colonies, provide a breeding population estimate for the region, and establish a baseline for monitoring Pacific Common Eider populations in the future, aerial and ground surveys were conducted over 3 years beginning in 1995. The breeding population for the central Arctic was estimated at about 37 000, and the primary nesting areas were identified as southeastern Dolphin and Union Strait, outer Bathurst Inlet, Melville Sound, Elu Inlet and central Queen Maud Gulf (L. Dickson, pers. comm.).

Aerial surveys in late June in the Bathurst Inlet area were conducted in 1995 and in 2006–2008 to establish a baseline for monitoring Pacific Common Eider breeding population trends (Raven and Dickson 2008). At a subset of 24 colonies in the same area, nest success and annual survival of adult females were monitored over a 7-year period starting in 2001 (Hoover and Dickson 2007).

Satellite telemetry of eiders from a nesting colony near Bathurst Inlet, Nunavut, indicated that most of these eiders winter off the southeast coast of Chukotka Peninsula, Russia, and off the coast of St. Lawrence Island, Alaska (Dickson 2012b). About one third of the males also moult off Russia. Harvest information for eastern Russia is limited, but suggests a substantial take of eiders. A rough estimate of the subsistence harvest in 2001 in Chukotka was 115 000 eiders (from 4 different species; E. Syroechkovski Jr., pers. comm.). However, it is not known what percentage of this take is Pacific Common Eiders from Canadian breeding grounds. The subsistence harvest of

Pacific Common Eiders in Canada and Alaska is an estimated 2500 birds per year (Fabijan et al. 1997).

Northern Common Eider

The northern subspecies of the Common Eider breeds throughout the coastal areas of the eastern Canadian Arctic and Greenland, and winters along the coasts of Newfoundland and Labrador, Quebec, and southwest Greenland. This subspecies is unique in that it is intensively harvested commercially in west Greenland and is subjected to both subsistence and recreational harvest in Canada. Demographic modelling recently suggested that harvest levels were unsustainable (Gilliland et al. 2009). The bulk of the harvests occur in Greenland and insular Newfoundland, but harvest levels in Greenland were determined to be excessive, leading to a harvest allocation issue with Canada. More restrictive harvest regulations were put in place in Newfoundland in 1997 and Greenland in 2002–2004 (Merkel 2010), resulting in a decrease in overall harvest, but harvest levels remain high. Pressures to liberalize harvest in Greenland and Newfoundland continue, and population impacts of recent avian cholera outbreaks in the Canadian Arctic continue to be a major population threat.

Despite the harvest issue, there is no recent data on breeding areas: the very large distribution of this subspecies in the Canadian Arctic makes it very difficult to survey on a regular basis. Historical data exist only for three sites: Ungava Bay, Hells Gate (High Arctic) and Digges Sound. Recent surveys in Greenland indicate that dramatic population declines have occurred since the 1970s. However, a community-based monitoring program implemented following the 2002–2004 harvest restriction has documented a strong recovery of eiders breeding in western Greenland (Merkel, pers. comm.)

A winter monitoring program was implemented in 2003 to estimate population size and trends for the component of this subspecies that overwinters in Canada. The entire wintering range of Northern Common Eiders in eastern Canada (and St. Pierre and Miquelon, France) has been surveyed every third winter since the survey was implemented in 2003. Population estimates in 2003, 2006 and 2009 were $204\,000 \pm 15\,500$, $175\,800 \pm 8000$ and $204\,800 \pm 22\,400$, respectively, suggesting that the Canadian overwintering component has been stable over this period (Gilliland et al., in prep.). The survey of the wintering range was repeated in February 2012, but results have not been photo-corrected yet.

Emerging threats for Northern Eiders include disease, disturbance of breeding colonies by polar bears, increased shipping through Hudson Strait, oil mortality, and high harvest in Newfoundland. For example, the first recorded Arctic outbreaks of avian

cholera were recorded in Common Eiders in 2004 (northern Quebec), 2005 (Southampton Island) and 2006–2007 (Southampton Island and northern Quebec). Between 2004 and 2005, many hundreds of Common Eider ducks died of avian cholera at nesting colonies in northern Hudson Bay and west Hudson Strait in July and August. This finding was first detected by local residents hunting in the area near Ivujivik, northern Quebec. In the summer of 2006, cholera was again detected at eider colonies along the northern coasts of Quebec in Nunavik, and at East Bay, Southampton Island, Nunavut. At East Bay, over 3200 eiders (i.e., more than 40% of the nesting females) were killed between late June and early August 2006 (Gilchrist, unpubl. data). Similarly, Inuit from Nunavut and Nunavik have recently reported catastrophic losses at many breeding colonies as a result of polar bear activity. Although polar bear activity has been observed intermittently, it has never been observed at the current levels, and cholera has never been observed in Arctic breeding eiders.

Harvest information is estimated through the national harvest survey programs in Canada and the U.S., and these estimates are thought to be imprecise for most sea duck species. This survey has shown that harvest of eiders has generally declined over the last 30 years; however, harvests in Newfoundland and Labrador have been increasing since 2005, and unusually high levels were recorded in 2007 and 2008. These levels have not been observed since the mid-1980s and may be unsustainable (Gilliland et al. 2009).

Hudson Bay Common Eider

The Hudson Bay subspecies of the Common Eider breeds within Hudson Bay and winters in open water leads near the Belcher Islands and off the western coast of Quebec. This is one of the only waterfowl species in the world that spends the entire year in Arctic waters. Mass die-offs can occur in winter when large portions of the population are concentrated in open-water leads that sometimes freeze over (Robertson and Gilchrist 1998). The frequency and magnitude of these die-offs and the impact that they have on the Hudson Bay Common Eider population is unknown.

Breeding data for this subspecies only exist for the Belcher Islands and the area of La Perouse Bay, Manitoba. The Belcher Islands, first surveyed in the 1980s, were resurveyed in 1997. The results showed that the breeding population had declined by 70% since the late 1980s, apparently due to winter weather events (e.g., freezing of polynyas) that led to high levels of mortality in 1992 (Robertson and Gilchrist 1998). The CWS initiated research into the winter ecology of Hudson Bay Common Eiders in

1998. The three winters that followed were mild, with vast expanses of open sea available to foraging flocks. There have been no significant winter kill events since this work began, and the eider population appears to be recovering.

American Common Eider

The current American Common Eider population estimate is around 300 000 birds (Lepage and Bordage 2013), and this eider is among the most commonly harvested waterfowl in several coastal regions of eastern Canada and the U.S. The sustainable harvest rate was estimated around 10% (Savard et al. 2004), and the current harvest estimate is about 32 000 birds, which exceeds the estimate of sustainable harvest for this subspecies. Historically, the majority of the American Common Eider harvest occurred in Canada; however, the Canadian harvest has declined, while the subspecies has become the focus of outfitted hunts along the eastern seaboard of the U.S., and the U.S. now takes about 65% of the total harvest. In addition to the recreational harvest, American Common Eiders are harvested for Aboriginal subsistence use and are locally important for some Aboriginal communities in Quebec and Atlantic Canada; no estimates of subsistence harvest are available. Eiderdown harvest also represents an important economic activity in the St. Lawrence Estuary.

Reliable data for breeding areas only exist for segments of the population that breed in the St. Lawrence Estuary and the North Shore of the Gulf of St. Lawrence. Trends were stable in the estuary and appeared to be increasing in the Gulf of St. Lawrence (Rail and Cotter 2007), but now appear to be declining at about 3% per year (J.-F. Giroux, Université du Québec à Montréal, pers. comm.). The number of eiders breeding in northern Newfoundland and southern Labrador also appear to be increasing (S. Gilliland, unpubl. data). There is little information on the status of the population segments breeding in the southern portion of their range. Preliminary analysis suggests that eiders breeding in New Brunswick may be experiencing a long-term decline of about 3% per year (K. Conner, unpubl. data), and anecdotal information for Nova Scotia and Maine suggests declines in the number and size of breeding colonies in these areas.

Diseases may play an important role in the dynamics of this population. Intermittent outbreaks of avian cholera have been reported throughout their range, with the most recent event occurring in 2002, when an estimated 6000 adult females died at breeding colonies in the St. Lawrence Estuary (Joint Working Group on the Management of the Common Eider 2004). Beginning in 1998, 11 mystery winter mortality events involving 30 to 2800 eiders were

observed along the coast of Cape Cod, Massachusetts (C. Dwyer, unpubl. report). In late 2010, diagnosticians at the Southeast Cooperative Wildlife Disease Study (SCWDS) at the University of Georgia isolated a previously undescribed orthomyxovirus, tentatively named Wellfleet Bay Virus, implicated in the die-offs (C. Dwyer, pers. comm.). The impacts of these emerging and re-emerging diseases on American Common Eiders is poorly understood; however, research programs at the Université du Québec à Montréal, led by J.-F. Giroux, are focusing on the impact of avian cholera on population dynamics of eiders breeding in the St. Lawrence Estuary, and the U.S. Geological Survey's National Wildlife Health Center has been collaborating with the SCWDS and the USFWS to further characterize the orthomyxovirus.

In addition to diseases, recent changes in predator communities have also been implicated as potential stresses on American Eiders breeding in the southern portion of their breeding range. Population recovery of river otters, Great Black-backed Gulls and Bald Eagles have all been identified as potential sources of mortality and disturbance at American Eider breeding colonies in Nova Scotia, New Brunswick and Maine.

In response to concerns for this population, resource agencies in Canada and the U.S. are currently undertaking an assessment of the status of this population and are planning to implement a regular range-wide monitoring program for American Eiders (see Gilliland et al. 2011 and SDJV 2007). Accordingly, in May 2012, preliminary surveys of a few colonies in the St. Lawrence Estuary were conducted to test feasibility of counting males from the air and repeatability as a first step towards a concerted range-wide monitoring program.

Harlequin Duck

Until the 1990s, there was little knowledge of the ecology of Harlequin Ducks (*Histrionicus histrionicus*) in North America. However, research efforts have improved understanding of this species in some areas. Robertson and Goudie (1999) provide a review of available information on the Harlequin Duck.

Eastern Population

The eastern North American population of the Harlequin Duck was assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as endangered in Canada in 1990. As a consequence, hunting of this species was shut down throughout the Atlantic Flyway. In the late 1980s, the population overwintering in eastern North America was estimated at less than 1000 individuals (Goudie

1991). Overhunting, disturbance and habitat loss are believed to have played a role in the decline of the population (Robertson and Goudie 1999). Later, new information indicating the number of harlequins breeding in Eastern Canada to be significantly larger than suspected led to the population being reassessed as a population of Special Concern (Thomas and Robert 2001).

Studies based on satellite telemetry suggested the existence of two Harlequin Duck populations: one that breeds in northern Quebec and Labrador and overwinters in southwest Greenland, and one that breeds in southern Labrador, Newfoundland, New Brunswick and the Gaspé Peninsula of Quebec, and winters mostly in the Maritimes and Maine (Brodeur et al. 2002). Genetic studies support the existence of two populations with minimal gene flow (Scribner et al. 2000). The extent to which the breeding and wintering areas of these populations overlap is unknown. The size of the harlequin population that originates in Canada and overwinters in Greenland is also not known, but 6200 moulting harlequins were estimated along the western coast of Greenland during surveys in 1999 (Boertmann and Mosbech 2002). The population of Harlequin Ducks wintering in eastern North America is estimated at about 3000 birds, with slightly more than half (~1600) wintering in Maine at a single location (Mittelhauser 2008; Robertson and Goudie 1999; Thomas and Robert 2001). Numbers of Harlequin Ducks wintering in Eastern Canada have shown increases since the mid-1980s. Winter surveys conducted in 2010 identified approximately 300 birds in the Bay of Fundy, 600 on the southern and eastern coasts of Nova Scotia, and roughly 450 wintering in Newfoundland. This was encouraging news, given the dramatic decline that occurred there through the 1980s and early 1990s.

Robertson et al. (2008) published a summary of the status of the eastern population of Harlequin Duck, and a document entitled *Management Plan for the Harlequin Duck (Histrionicus histrionicus), Eastern Population, in Atlantic Canada and Quebec* is available at www.sararegistry.gc.ca/document/dspdocument_e.cfm?documentid=1276.

Western Population

Reflecting conservation concern for Harlequin Ducks, considerable attention has focused on western populations, particularly in the Strait of Georgia, over the past 15 years (S. Boyd and D. Esler, pers. comm.). Collaborative efforts by the CWS and Simon Fraser University have revealed much about the ecology and conservation of Harlequin Ducks; in fact, Harlequin Ducks in the Strait of Georgia are frequently highlighted as one of the sea ducks about which an unprecedented

understanding of ecology and demography exists. In brief, findings include: (1) the Strait of Georgia provides non-breeding habitat for >10 000 Harlequin Ducks; (2) concentrations in the Strait of Georgia during the spring herring spawn number in the thousands, which is a globally unique aggregation; (3) birds wintering in British Columbia breed across a wide range of mountain streams throughout the province and beyond; (4) they show very strong fidelity to wintering and moulting sites, which means that local aggregations are largely demographically discrete and therefore vulnerable to high harvest and/or disturbance levels as well as habitat change; (5) at least some ducklings follow their mothers to wintering areas, further contributing to the formation of distinct, independent population segments; (6) annual survival of adults appears to be high and sustainable; and (7) production of young birds appears to be sufficient to maintain stable population numbers (S. Boyd and D. Esler, pers. comm.).

Focused studies of Harlequin Ducks in the Strait of Georgia are coming to a close. The CWS is completing an analysis of leg band data to determine survival rates, and will eventually publish the results. The CWS also hopes to re-establish field surveys of productivity, based on counts of male age ratios during winter, in order to document annual variation and derive long-term means. Also, a research program was completed by the Centre for Wildlife Ecology at Simon Fraser University to evaluate the roles of habitat quality and acquisition of nutrients for clutch formation (S. Boyd and D. Esler, pers. comm.).

An interesting behavioural change has occurred in recent years. Until just a few years ago, adult male Harlequin ducks typically returned to the White Rock B.C. area and nearby Birch Bay and Pt Roberts areas in WA State in the June-July period to moult their body and flight feathers. The males would then reconnect with their long-term partners once females completed their own moults, which usually occurred 1–2 months later than the males. However, that pattern does not occur anymore; the males now return 2–2.5 months later than they did historically and most show up in pre-alternate plumage. The reasons behind this change are unknown but they may be related to relatively high levels of disturbance from people, dogs etc. on the beaches during the male moult period, predation risk from an increasing Bald eagle population, a changing climate, or a combination of these and other factors. Harlequin duck numbers at White Rock have been declining gradually so it is possible that this behavioural change is somehow having a local population-level effect and it could also be important at the larger Salish Sea scale. Continued monitoring at the above three sites and at other Salish Sea sites, and tracking the summer-fall

movement patterns of adult males, will help managers understand the long-term impact of this relatively new phenomenon.

Scoters

The three species of scoters that breed in Canada are Black Scoters (*Melanitta americana*), Surf Scoters (*M. perspicillata*) and White-winged Scoters (*M. fusca*). Less is known about scoters than about any other group of sea ducks. Research efforts in recent years have brought us to a better understanding of the breeding, moulting and wintering ecology of this group. Bordage and Savard (1995), Brown and Fredrickson (1997), and Savard et al. (1998) all provide useful reviews of the information available on scoters. Several projects supported by the SDJV have also addressed research on important information gaps about scoters (www.seaduckjv.org/ssna.html).

Eastern Canada

Most Black Scoters breed in Eastern Canada, and until recently the eastern breeding ground was thought to be centred in northern Quebec. However, recent satellite telemetry studies (2009–2010) of migrating birds marked in spring in the Chaleur Bay give evidence that pairs also breed west of Quebec, i.e., in northwestern Ontario, northern Manitoba, Nunavut and the Northwest Territories east of Great Slave Lake (SDJV 2012). Western Black Scoters have a breeding ground centred in Alaska (Bordage and Savard 1995).

Surf Scoters are counted during the Eastern Waterfowl Survey, although the area surveyed (Figure 1) only partially covers the southern extent of the Surf Scoter breeding distribution. According to the Eastern Waterfowl Survey, Surf Scoters continue to do well in the boreal forest (Figure 22).

White-winged Scoters in Eastern Canada are the least numerous scoters. Known breeding grounds appear to be discontinuous, with a small population breeding by lakes along the northeastern corner of James Bay on the Quebec side, and the rest of eastern wintering and molting birds breeding from northern Manitoba as far west as the Great Bear Lake in the Northwest Territories (C. Lepage, CWS, pers. comm.).

The Chaleur Bay area as well as the St. Lawrence Estuary and Gulf are major spring staging areas for scoters. Aerial surveys that had been photo-corrected for observer error indicated an Atlantic Flyway spring staging population of about 90 000 Black Scoters, i.e., 52 000 in the Chaleur Bay and 36 300 in the St. Lawrence Estuary in 2005 (K. McAloney, CWS, unpubl. data). In 1998, over

220 000 scoters (the 3 species) were staging in the St. Lawrence Estuary and Gulf (Rail and Savard 2003). Surf Scoters are the most numerous scoters in that region and are estimated to account for 70% of scoters.

While ground surveys in late July and early August of 2006 indicated that some 50 000 scoters (mostly male Surf and White-winged Scoters) moulted within the St. Lawrence Estuary (J.P. Savard, pers. comm.), a 2010 aerial survey reported approximately 90 000 moulting scoters in the same region; 95% of these scoters were Surfs (Bolduc et al. 2011). Between 50 000 and 62 000 moulting scoters (mostly male Surf Scoters) were sighted along the Labrador coast in 1998 and 1999 (S. Gilliland, pers. comm.).

Developmental photographic aerial surveys of moulting (primarily male) Black Scoters have been ongoing since 2006 in the James Bay area. During the 2006, 2009 and 2012 surveys, a total of 88 460, 106 600 and 125 369 Black Scoters, respectively, were observed in the core survey area in western James Bay (Badzinski et al. 2012). A reconnaissance survey conducted during July 2009 documented relatively few (4 331) Black Scoters using eastern Hudson Bay (south of Belcher Islands) and eastern James Bay (Cotter 2009). Recent satellite telemetry data suggests that in addition to eastern Hudson Bay and both sides of James Bay, Black Scoters also congregate to moult off the north coast of Ontario along the western Hudson Bay coastline (SDJV 2012).

In 2013, reconnaissance surveys employing visual estimates conducted during late July and early August documented about 45 000 Black, Surf and White-winged Scoters moulting in eastern James Bay in an area around Charlton Island and along the Quebec coastline. Approximately 40 000 Surf, White-winged and Black Scoters also were observed in an area around the Belcher Islands and along the eastern Hudson Bay coastline up to and including Lac Guillaume-Delisle in Quebec. Also, about 110 000 scoters (predominately Black Scoter) were observed in western Hudson Bay scattered along the coastline as far north as Churchill, Manitoba, with the majority (90 000) occurring between the Ontario/Manitoba border and Nelson River inlet (S. Badzinski, pers. obs.). Consequently, a new reconnaissance survey covering the full known extent of moulting birds was conducted in late July and early August 2013 to determine numbers and confirm distribution.

Surveys in September and October 2006 indicated that the St. Lawrence Estuary was an important staging area for Surf Scoters in fall, since nearly 80 000 birds were counted there (J.-P. Savard, CWS, pers. comm.).

Recently, many efforts were made by CWS to

mark scoters with satellite transmitters, as part of the larger Atlantic and Great Lakes Sea Duck Migration Study (seaduckiv.org/atlantic_migration_study.html). In 2010, 19 White-winged and 48 Black Scoters were marked with satellite transmitters in the St. Lawrence Estuary and Chaleur Bay. Movements of marked birds are available at www.seaturtle.org/tracking/?project_id=538 (White-winged Scoters) and www.seaturtle.org/tracking/index.shtml?project_id=499 (Black Scoters). In 2012, an additional 17 White-winged Scoters and 26 Surf Scoters were marked in the St. Lawrence Estuary (www.seaturtle.org/tracking/?project_id=759). To increase the sample size for Eastern Surf Scoters, 53 more satellite transmitters were implanted in October 2013 in the St. Lawrence Estuary (www.seaturtle.org/tracking/index.shtml?project_id=928). All these marked birds should provide valuable information on seasonal connectivity, timing and direction of movements, and site fidelity to wintering, breeding and moult sites.

Western Canada

The traditional survey area of the WBPHS in Western Canada (Figure 6) covers a large part of the breeding area of White-winged Scoters and a substantial portion of the Surf Scoter range. The three species of scoter are not differentiated during these surveys, however, as it is difficult to distinguish among them from fixed-wing aircraft. Based on the extent of known breeding distributions, scoter populations in the Canadian Prairies should be White-winged Scoters only, while populations in Western Boreal Canada include White-winged and Surf Scoters. All three species are present in Alaska. However, these data should be interpreted with caution, as the surveys are not well designed for estimating scoter numbers (Savard et al. 1998). There is no data available for Scoters in these areas in 2013.

Although found at very low densities on the Canadian Prairies, scoter numbers have declined over the long term based on the results of the WBPHS (Figure 23). Surveys in 2012 indicated an estimated 1.06 million individuals in the entire survey area, which is a decrease of 29% from 2011 (Figure 23).

A more detailed examination of trends in various strata showed intriguing results. Alisauskas et al. (2004) showed that, contrary to the overall declining trend, scoters increased over the previous decade in northern Manitoba and Saskatchewan but continued to decline in northern Alberta and the Northwest Territories. Their research, making use of reverse-time capture histories of White-winged Scoters at Redberry Lake, Saskatchewan, shows the long-term decline in the local population has now been

arrested. Interestingly, this occurred as a result of increased recruitment through the immigration of adult females (Alisauskas et al. 2004).

Large concentrations of Surf Scoters and White-winged Scoters are found in coastal British Columbia, in habitats that also support shellfish aquaculture, an industry that has the potential to expand dramatically. Simon Fraser University and CWS have completed a study of the interactions between scoters and the shellfish industry, evaluating potential effects on scoter population sustainability at local and regional scales (S. Boyd and D. Esler, pers. comm.). The findings suggest that, at current levels of activity, the overall effect of the industry in one important area for both shellfish and scoters is sustainable (Baynes Sound). The project has resulted in the publication of several papers and two master's theses.

In response to the apparent decline in scoter numbers, reductions were made in 1993 to the bag limits for scoters in the U.S. and Canada. The harvest of all three scoter species in Canada and the U.S. has declined considerably since the 1970s (Tables 9 to 11), although harvest levels of Surf and Black Scoters in the Atlantic Flyway in 2011 again appeared to be near historic levels. In Canada, the harvest is estimated at a few thousand birds of each of the three species.

Barrow's Goldeneye

Eastern Population

In 2000, the small eastern population of Barrow's Goldeneye (*Bucephala islandica*) was assessed by COSEWIC as being of Special Concern. Because of the potential threat to the species, most Barrow's Goldeneye wintering and staging areas in Canada have been closed to hunting. However, because the Barrow's Goldeneye is an arboreal species, forestry operations and introduction of fish on fishless lakes on its breeding grounds are more likely to be threats (Robert et al. 2008).

The main breeding area of the eastern population of Barrow's Goldeneye consists of the small fishless lakes of the high plateaus north of the St. Lawrence River from the Saguenay River east to Blanc-Sablon, Quebec (Robert et al. 2000; Robert et al. 2008). In fact, high numbers of pairs and lone males detected in aerial and ground surveys indicate that this area is probably the core breeding area for the eastern population of the Barrow's Goldeneye (Robert et al. 2000).

In eastern North America, the only known moulting sites for adult male Barrow's Goldeneyes are located in the coastal waters of Hudson, Ungava and Frobisher (Baffin Island) bays, and in a few

coastal inlets of northern Labrador (Robert et al. 1999; Robert et al. 2002). Two moulting areas (Tasiujaq and Tuttutuq River, Ungava Bay) were identified while tracking males with satellite telemetry in July 2000. At least 200 goldeneyes (mostly Barrow's) were at the first location, while at least 3000 goldeneyes (mostly Common) were in the latter area (M. Robert, pers. comm.). Barrow's Goldeneye spent up to four months in the moulting locations, highlighting the importance of these areas in the annual cycle (Robert et al. 2002).

During the 2009 breeding season, five female Barrow's Goldeneyes were implanted with satellite transmitters in order to locate their moulting sites. Two females returned to moult in 2010 at the same location as in 2009 (one on a lake 100 km south of Ungava Bay and one in an inlet of Ungava Bay), and one female that moulted on a small lake near James Bay in 2009 apparently moulted in the St. Lawrence River in 2010 (Savard and Robert 2013). Movements of implanted females can be viewed at www.seaturtle.org/tracking/?project_id=415.

Since 2005, a triennial winter survey has been conducted in Quebec and New Brunswick. The 2011 results indicated that the eastern North American wintering population of Barrow's Goldeneyes was composed of 4100 individuals (F. Bolduc, unpubl. data), compared with 6800 individuals in the 2009 survey (Robert 2013). More than 95% winter along the St. Lawrence Estuary and Gulf (Environment Canada 2013). About 500 individuals winter in the Atlantic provinces and 100 individuals winter in Maine (Robert and Savard 2006; Environment Canada 2013).

Results of Christmas bird counts from Tadoussac suggest a slight increase in Barrow's Goldeneye numbers in the last decade (Savard 2008).

Western Population

The Waterfowl Breeding Population Survey of the British Columbia Central Interior Plateau has tracked the western population of Barrow's Goldeneye since 2006. CWS analyses estimated the presence of 22 848 individuals in the Central Interior Plateau in 2013, 5% more than in 2012. Some data are available for this population from the breeding waterfowl surveys of the southern Yukon (Figure 24), where there is no discernible trend in the population over the past 5, 10, 15 or 21 years.

From 2006 to 2011, W.S. Boyd (Environment Canada, Science and Technology Branch) and D. Esler (Simon Fraser University – Centre for Wildlife Ecology) have satellite-tagged all age and sex classes of Barrow's Goldeneye at a study site in the interior of B.C. (Riske Creek). All males marked in May 2006, 2007 and 2008 migrated north to northern Alberta and the Northwest Territories to

moult, and many are showing high site-fidelity to both moulting and wintering sites, and an especially strong connection with a moulting/staging site at Cardinal Lake in Alberta. Some hatch-year birds marked in August 2011 are still being tracked. Maps showing movement and location data for all marked birds are available at www.sfu.ca/biology/wildberg/CWESeaducksfolder/BAGOwebpage/BAGOMigrationHome.html. These maps contain data only to August 2011; they will be updated in the near future. The satellite data will be used to determine migration routes, site fidelity and affiliations between breeding, moulting, staging and wintering sites. The data will also be used to further our understanding of the population structure for Pacific Barrow's Goldeneye.

Other Sea Ducks

Information on other sea duck species from the WBPBS in Western Canada and the Eastern Waterfowl Survey is presented in Table 3 and Figure 22, respectively. Information on Bufflehead and other diving and sea ducks from the roadside surveys in the Yukon is presented in Figure 24.

The WBPBS in Western Canada shows significant increases in numbers of Goldeneyes and Buffleheads over the long term (Table 3). Technical issues with some of the survey aircrafts resulted in lack of data for mergansers and Long-tailed Ducks in 2013, so trends for the entire survey area and some regions could not be calculated.

For the period 1990–2013, the Eastern Waterfowl Survey showed an increasing trend for Hooded Merganser. Population levels for Bufflehead, Common Merganser and Red-breasted Merganser have been variable. Surf Scoter and Common Goldeneye populations have shown relatively stable trends (Figure 22).

Population Status of Geese

Snow Goose

Greater Snow Goose

Greater Snow Geese (*Chen caerulescens atlanticus*) breed in the eastern Arctic around northern Foxe Basin, northern Baffin, Bylot, Axel Heiberg and Ellesmere islands, and northern Greenland. They winter along the mid-Atlantic coast from New Jersey to North Carolina. During migration, the entire population stages in southern Quebec in the marshes and agricultural lands.

The growth of the Greater Snow Goose population from a few thousand birds in the 1930s to over 500 000 in spring in the mid-1990s has been

well documented (Reed et al. 1998a). Special conservation measures were implemented in 1999 to slow the rapid growth rate of the population of the Greater Snow Goose.

Aerial surveys of the spring staging area in the St. Lawrence River Valley in southern Quebec have been conducted annually since 1965. The survey covers a large territory extending from Lac Champlain (south) to Lac St-Jean (north), and from eastern Ontario (west) to the Chaleur Bay (east). Five aircraft are used simultaneously to ensure complete coverage during a one-day survey. In 2013, the survey was carried out on April 28. The size of the 2013 spring population during staging in southern Quebec was estimated at 921 000 (CI 63 000) geese, approximately 10% less than the previous year's estimate (1 005 000; Figure 25; Lefebvre 2013). Estimates have been calculated using a revised sampling methodology since 2008.

In Canada, the 2012 fall goose harvest was estimated at 66 858 (Table 12), lower than the 2010 harvest (98 980) and below the 5-year average (77 062). In the U.S., the harvest was estimated at about 41 251 birds, which was slightly higher than last year's estimate.

An estimated $22\,461 \pm 3260$ birds were harvested during the special conservation measures in spring 2013 in Quebec (Smith and Gendron 2013a). The numbers harvested were below the 2012 estimate (35 738; Figure 26). A source of bias in the spring harvest estimation approach was detected, and work is being done to correct estimates in the future. Accounting for this bias, the 2012 harvest is estimated at $30\,702 \pm 3413$ (estimates from other years have not been corrected, such that the 2012 estimate cannot be directly compared to those).

A special conservation season was implemented in southern Ontario in 2012. In 2013, an estimated 1397 ± 828 geese were harvested compared to 256 geese in 2012 (Smith and Gendron 2013b). Accounting for the bias referred to above, the 2012 harvest is estimated at 1635 ± 828 .

In 2009, special conservation measures for Greater Snow Geese were put in place in several U.S. states of the Atlantic Flyway. In spring 2013, the estimated retrieved flyway harvest of Greater Snow Geese was 55 903 birds with an additional 2559 birds shot and lost (Snow Goose, Brant and Swan Committee of the Atlantic Flyway Council, 2013).

A detailed study of the reproductive ecology of Greater Snow Geese at the Bylot Island breeding colony in Nunavut has been conducted since 1988. Bylot Island is located off the northern end of Baffin Island in the eastern High Arctic; it harbours the largest breeding colony of Greater Snow Geese on its southwest plain. More information is available

about this research project at:
www.cen.ulaval.ca/bylot/.

Lesser Snow Goose

Lesser Snow Geese (*Chen caerulescens caerulescens*) nest in colonies in coastal and inland areas of the Canadian Arctic. These colonies can be grouped according to three regions: the eastern Arctic (Southampton and Baffin islands, and the western and southern shores of Hudson Bay), the central Arctic (mainland from Coppermine in the west to Gjoa Haven in the east, and western Victoria Island), and the western Arctic (Banks Island, and the Anderson and Mackenzie River deltas).

Breeding ground surveys have shown substantial growth of Lesser Snow Goose populations at several colonies and the establishment of new colonies in recent years (Batt 1997). The CWS is coordinating a series of photographic inventories of major Lesser Snow Goose nesting colonies, and these results are reported below.

The increasing number of Lesser Snow Geese in the eastern and central Arctic is also indexed by surveys on wintering areas throughout the late 1990s. It should be noted that these geese are also referred to as mid-continent Lesser Snow Geese. Mid-winter counts increased from 0.78 million geese in 1970 to nearly 3.0 million in 1998 (Kruse 2007). The 2012 mid-winter count was about 4.02 million geese, 27% more than in 2011, and a record high for the second year in a row (Figure 27; USFWS 2013). These counts include some Ross's Geese and probably a small proportion of Lesser Snow Geese originating from western Arctic colonies. However, mid-winter counts underestimate actual population levels, and probably increasingly so, as populations have grown (Leafloor et al. 2012).

Recently, the population size of Lesser Snow Geese has been estimated using band recovery data and harvest estimates (Alisauskas et al. 2009; Alisauskas et al. 2011, 2012). Traditional survey approaches provide only indices of population size, but the estimates derived from harvest and banding data suggest numbers that are considerably higher than previously thought. The mid-continent population of Lesser Snow Geese likely exceeded 15 million adult birds in 2010, and some estimates suggest that the population could be even larger than that (Alisauskas et al. 2011, 2012). Despite recent efforts to reduce numbers of mid-continent Lesser Snow Geese, the population continues to grow (Leafloor et al. 2012).

Eastern Arctic Colonies

Baffin Island and Southampton Island

Between 2003 and 2005, photographic inventories of the largest Lesser Snow Goose nesting colonies in the eastern Arctic were conducted, for comparison to earlier counts in the early 1970s and 1997. When the Great Plain of the Koukdjuak (on Baffin Island) and Southampton Island were first surveyed in 1973, there were only 446 600 and 155 800 nesting birds, respectively (Kerbes 1975), and the area where nests were found was much smaller. By 1997, those colonies had grown to 1.7 and 0.7 million nesting birds, respectively (Figure 28). Estimates of nesting Snow Geese on Southampton Island in 2004 suggested numbers similar to 1997, whereas those estimated on Baffin Island in 2005 indicated that the population may have declined slightly (Figure 28). The most recent estimates of nesting birds from photographic surveys on Southampton Island indicate that Lesser Snow Goose numbers have in fact continued to grow and approached 1 million nesting birds in 2008 (K.M. Meeres, CWS Saskatoon, unpubl. data). A photographic survey of Baffin Island was conducted in 2011, but results are not yet available. Numbers of goslings on Baffin Island in August 2013 were lower than those seen in 2012, and brood flocks were largely absent, suggesting that nesting effort of Lesser Snow Geese in 2013 was poor compared to last year (J.O. Leafloor, CWS Winnipeg, pers. obs.). By contrast, large numbers of goslings and widespread brood flocks of Snow Geese were observed on Southampton Island in 2013 (J. Ingram, CWS Winnipeg, pers. obs.).

West Hudson Bay

At West Hudson Bay, Snow Goose numbers declined by about half between 1985 and 1997, when they numbered just over 200 000 geese (Figure 28). Estimates from photo surveys conducted in 2003 suggest that the nesting population increased slightly between 1997 and 2003, but that most of the increase occurred north of the traditional nesting colony centred at the McConnell River and especially to the north of Arviat, Nunavut. The most recent photographic estimates of nesting geese in this region suggest that numbers of Lesser Snow Geese remained stable at about 250 000 birds in 2008 (K.M. Meeres, unpubl. data).

Hudson Bay Lowlands (Akimiski Island, Cape Henrietta Maria and La Pérouse Bay)

In the Hudson Bay lowlands, surveys conducted between 1996 and 2003 showed the number of nesting pairs to be declining from the peak in 1997, when 430 000 birds were estimated nesting in the area between La Pérouse Bay, Manitoba, and Cape Henrietta Maria, Ontario (K. Ross and K. Abraham, pers. comm.). The 2006 survey of the La Pérouse Bay colony yielded 41 800 breeding pairs, virtually the same number as in 1997 (i.e., 41 700 pairs); the two small colonies near Thompson Point held 1700 and 5400 pairs, respectively (K. Abraham, R. Rockwell and K. Ross, pers. comm.). A new spatial analysis of helicopter surveys conducted on the Cape Henrietta Maria colony suggest a recent decline in the number of breeding birds from an average for the 1997 to 2007 period (1997, 1999, 2001, 2003, 2005, 2007) of 332 400 to lows of 230 556 and 202 140 in 2007 and 2012, respectively. There was an extreme low number of nesting birds observed in 2009, but a late spring characterized by spring flooding prevented many birds from attempting to nest. In 2009, only 17 944 breeding birds were estimated. With the exception of 2009, these data represent a considerable increase from 1979, when the nesting population was estimated at 55 000 nesting pairs (P. Anghern, unpubl. report). A reconnaissance survey of the former Shell Brook colony area in late July 2013 revealed few geese, but a similar survey of the West Pen Island colony yielded a photographic tally of 9035 adults. This is a 45% decline since 1997, when 16 600 breeding geese were estimated (Kerbes 1994).

Timing of the spring thaw was later in 2013 than in 2012 and more comparable to the long-term average in the Hudson Bay Lowlands. The thaw was relatively later in the western Hudson Bay Lowlands than in the eastern Hudson Bay Lowlands. In James Bay, the small Akimiski Island colony consistently had an estimated 900 breeding pairs between 1998 and 2000, increasing to about 1500 pairs in 2001 and remaining about the same in 2003 (K. Abraham and Rod Brook, pers. comm.). Timing of nest initiation by Lesser Snow Geese on Akimiski Island appeared to be similar to the long-term average in 2013. Clutch size during late incubation searches was near average. Age ratio at banding was 1.6 goslings per adult, indicating a good production year. At Cape Henrietta Maria, the timing of spring thaw was similar to the long-term average. The area occupied by the colony appeared to be similar to the last decade (K. Abraham, Ontario Ministry of Natural Resources, pers. comm.), and age ratio during mid-brood rearing was 1.2 (\pm 0.13). Age ratio in mid-brood rearing at the Pen Island colony was 1.4 (\pm 0.08). Nesting studies of Lesser Snow Geese at La Pérouse Bay and the Cape Churchill region indicated one of the earlier snow melts recorded in

the 45 years of the project. Despite this early phenology, which affected plants, Lesser Snow Geese were slightly later than in 2012 and were about 4 days earlier than the long-term average. The colony has increased numerically and has expanded geographically, with nesting moving at least 5 km further inland along much of the coast between the White Whale and Broad Rivers. In 2013, 6064 Snow Geese were banded, including 3204 juveniles and 2860 adults, 539 of which were recaptures. The gosling to adult ratio of 1.12 in late brood rearing indicated high reproductive success. (R. Rockwell, American Museum of Natural History, New York, pers. comm.).

Central Arctic Colonies

The central Arctic breeding population, concentrated in the Queen Maud Gulf, grew more slowly than the eastern population before the 1980s, but now appears to be increasing rapidly. Part of the rapid growth may be due to the immigration of eastern Arctic birds. In 1976, there were 30 colonies with nearly 56 000 nesting Lesser Snow Geese. By 1988, the number of colonies had increased to 57, with about 280 000 nesting Lesser Snow Geese (Kerbes 1996). Information from a photographic inventory conducted in 1998 indicated that the Snow Goose population was in excess of 700 000, scattered over 80 colonies (R. Kerbes, unpubl. data). Concurrent with special conservation measures instituted to reduce the mid-continent population of snow geese, the number of breeding Snow Geese in the central Arctic estimated from aerial photography increased from 657 000 in 1998 to 1 666 000 by 2006 (K. Meeres, CWS, unpubl. data). Alisauskas et al. (2011) calculated that this was equivalent to a growth rate of 12.3% per year.

Lesser Snow Geese and Ross's Geese nesting timing and the production of young at Karrak are strongly linked to the timing of lake ice breakup. Although timing of nesting by both species has not yet been calculated for 2013, these Dates of Ice Breakup and Dates of First Gosling Seen in each year provide a general impression of conditions in the central Canadian Arctic, relative to long-term means. After 5 years of later-than-average Ice Breakup, Ice Breakup in 2013 was 9 days earlier than average, and 6 days earlier than in 2011. As well, the date that the first goslings were observed in 2012 was 2 days earlier than average and 1 day earlier than in 2011. This suggests that after several years in a row of later-than-average nesting (2007–2011), production of goslings in 2013, like 2012, is expected to be higher than average for geese from the Queen Maud Gulf Bird Sanctuary.

Population estimates of nesting Ross's Geese and Lesser Snow Geese are not yet available for

2013. Nevertheless, population growth over the longer term seems to have slowed and stabilized at about 700 000 nesting Ross's Geese, but had become a population decline from 2006–2008 for Lesser Snow Geese at Karrak Lake (Figure 29). For example, the number of light geese that nested on Karrak Lake in 2012 was about 1.28 million, of which 766 000 were Ross's Geese, but only 513 000 were Lesser Snow Geese. Much of the decline in nesting Snow Geese from 630 000 in 2006 to 346 000 in 2008 was related to the very late nesting conditions of 2007 to 2008, inclusive, which resulted in fewer Snow Geese attempting to nest. Since then, the number of nesting Snow Geese has recovered somewhat and continues to do so, but Ross's Geese now outnumber Snow Geese nesting at Karrak Lake.

Western Arctic Colonies

More than 95% of Lesser Snow Geese in the western Canadian Arctic nest on Banks Island. This population increased substantially between the 1960s and 2002. The total nesting population increased, growing from around 105 000 birds in 1960 to 165 000 in 1976, and exceeding 479 000 in 1995 (Kerbes et al. 1999a). Photographic inventories of the colony indicate that the number of nesting birds on Banks Island has remained high, with 570 000 nesting birds in 2002, 427 000 birds in 2009, and a preliminary estimate of 429 000 birds in 2013 (CWS, unpubl. data). Some localized habitat damage has occurred on Banks Island due to foraging activities from Snow Geese (Hines et al. 2010). The remaining western Arctic Snow Geese nest mostly at small colonies in the Anderson River and Kendall Island Migratory Bird Sanctuaries, as well as in Alaska. Numbers of nesting geese at Kendall Island have fluctuated between <500 and several thousand nesters, with no obvious long-term trend (Wiebe Robertson and Hines 2006; CWS, unpubl. data). Nesting numbers at Anderson River have declined from >8000 birds in the early 1980s to 2800 birds or less in recent years (Wiebe Robertson and Hines 2006; CWS, unpubl. data).

Lesser Snow Geese nesting on Wrangel Island, Russia, are also of great interest to Canada, because this population migrates through western Canada in fall and spring, and more than half of the population winters on the Fraser Delta (B.C.) and the nearby Skagit Delta (Washington). The present colony of Lesser Snow Geese on Wrangel Island is all that remains of several colonies that existed in Siberia a century ago. Russian biologists monitoring the population have documented a decline from 120 000 nesting birds in 1970 (total population of 150 000 geese) to fewer than half that number in the 1990s (total population of 60 000–70 000 geese;

Kerbes et al. 1999a). The total population has increased in recent years to 150 000–160 000 birds (S. Boyd, pers. comm.). No estimates are available from Russia on the size of the Wrangel Island spring 2013 breeding population.

The Fraser-Skagit winter population in British Columbia has roughly doubled since the early 1990s, increasing to ca. 100 000 birds in 2006–2007, the highest abundance ever recorded. Increased harvest rates combined with poor breeding years caused the population to decline to ca. 75 000 birds in 2009–2010 and ca. 65 000 in 2010–2011. The 2012–2013 wintering population was estimated at 69 964 birds, with 20.6% young (Sean Boyd, pers. comm.). Once the Fraser-Skagit winter population increased above ca. 60 000 birds in the early 2000s, increased conflicts (socio-economic) occurred with local farms, schools and the Vancouver International Airport on the Fraser Delta, and increased grubbing rates resulted in a severe reduction in bulrush biomass. Data from a long-term monitoring program suggest that large parts of the tidal marsh will move to a state of “functional extinction” if the number of geese remains high (S. Boyd, pers. comm.). To help alleviate the above concerns, responsible management agencies in British Columbia and Washington implemented amendments to hunting regulations in 2003–2004 and again in 2007–2008 to reduce the number of geese. This was followed by the implementation of a harvest strategy to maintain the Fraser-Skagit winter population within 50 000–70 000 total geese so that the marsh habitat remains at a healthy, sustainable level and socio-economic concerns are minimized. The primary goal of the harvest strategy is to make hunting regulations, and hence harvest rates, responsive to goose abundance. For a variety of reasons, the large majority of this harvest will occur on the Skagit Delta in Washington State.

Harvest of Lesser Snow Geese

In the United States, Lesser Snow Geese are harvested in all four flyways, but mostly in the Mississippi and Central flyways. In 2011, the total U.S. harvest estimate was 343 803 geese, a decrease of 3% compared to 2011 (Table 13). In Canada, the estimated harvest was 118 832 birds in 2012, an increase of 4% compared to 2011.

Since 1990, CWS Pacific and Yukon Region has conducted a special annual harvest survey of Lesser Snow Geese from the Wrangel Island population. Prior to 2003, harvest estimates varied from a low of 623 in 1990 to a high of 1989 in 2003 (A. Breault, unpubl. data; Figure 30). The 2012–2013 harvest was estimated at 3317 birds, 17% less than the 3990 birds harvested in 2011–2012. Harvest figures

include a +20% adjustment for crippling loss (A. Breault, pers. comm.).

An estimated $8\,613 \pm 4\,054$ birds were harvested during the special conservation measures in spring 2013 in Saskatchewan (there is no harvest survey in Manitoba and Nunavut, because of very low harvest and very few non-Aboriginal hunters, respectively; Smith and Gendron 2013c). Numbers harvested were 26% lower than the 2012 estimate ($11\,632 \pm 3\,521$). A source of bias in the spring harvest estimation approach was detected, and work is being done to correct estimates in the future. Accounting for this bias, the 2013 Saskatchewan harvest is estimated at $11\,721 \pm 4\,054$ (estimates from other years have not been corrected, such that the 2012 estimate cannot be directly compared to those).

Management of Overabundant Geese

Conservation Issue

Most Snow and Ross's Geese populations are well above their population objectives (NAWMP 2012). This becomes an important conservation issue when the rapid growth and increasing abundance affect the habitats on which they, and other species, depend. This relatively new issue was first highlighted over 15 years ago, through comprehensive assessments of the environmental effects of the rapidly growing populations of mid-continent Lesser Snow Geese and Greater Snow Geese. The analyses completed by Canadian and American experts are contained in the reports entitled *Arctic Ecosystems in Peril – Report of the Arctic Goose Habitat Working Group* (Batt 1997) and *The Greater Snow Goose – Report of the Arctic Goose Habitat Working Group* (Batt 1998).

These working groups concluded that the increase in Snow Geese populations was primarily human-induced. Changing farming practices began to supply a reliable, highly nutritious food source for migrating and wintering geese. Combined with the safety found in refuges, the improved nutritional status led to increased survival and higher reproductive rates for Snow Geese. These populations have become so large that they are affecting the plant communities at staging areas and breeding grounds on which they and other species rely. Grazing and grubbing by geese not only permanently removes vegetation, but also changes soil salinity, nitrogen dynamics and moisture levels. The result is the alteration or elimination of the plant communities. Although the Arctic is vast, the areas that support migrating and breeding geese and other companion species are limited in extent, and some areas are likely to become inhospitable for decades.

Increasing crop damage is another undesirable consequence of the growing goose populations.

Management Response

Initial management efforts focused on mid-continent Lesser Snow Geese and Greater Snow Geese, the populations where there was strong evidence for detrimental effects on habitats. Canada, the United States and Mexico agreed that the habitat damage being caused was a significant conservation issue, and that the populations were overabundant to the detriment of the arctic and sub-arctic ecosystems. Following that declaration, several concurrent management measures were begun to curtail the rapid population growth and reduce population size to a level consistent with the carrying capacity of the habitat. Population models showed that of all the potential management techniques, the most successful approach to control population growth would be to reduce survival rates for adult geese.

Therefore, beginning in 1999, Canada amended the *Migratory Birds Regulations* and created new tools that could be invoked to help manage overabundant species. These included special conditions under which hunters were encouraged to increase their take for conservation reasons and, in some cases and subject to specific controls, to use exceptional methods and equipment such as electronic calls and bait. The special conservation measures for Snow Geese were implemented in 1999 in selected areas of Quebec and Manitoba, were expanded in 2001 to Saskatchewan and Nunavut, and in 2012 into southeastern Ontario. The dates and locations of application of these special conservation measures were determined in consultation with the provincial governments, other organizations and local communities.

Effectiveness of Special Measures

Evaluations showed that success of the special conservation measures to date has been mixed. In the case of Greater Snow Geese, the special conservation measures were successful in reducing the annual survival rate for adults from about 83% to about 72.5% (Calvert and Gauthier 2005). The growth of the population was stopped, but the special measures have not succeeded in reducing the size of the population, which appears stabilized at about 1 million birds in spring (Lefebvre 2013). Models showed that without the special take by hunters in spring, the population would begin to grow rapidly once more (Gauthier and Reed 2007).

For mid-continent Lesser Snow Geese, the evaluation concluded that the population has continued to grow, although perhaps at a reduced

rate (Leafloor *et al.* 2012). It also concluded that while the annual harvest increased as a result of the conservation measures, it failed to reduce the size of the population. It was apparent that measures invoked to date have not been successful and that other measures would be required if population control were deemed essential. The report recommended that special conservation measures be maintained and that additional measures to increase harvest be sought.

The evaluation report also suggested that the conditions for overabundance designation are being met by Ross's Geese, and predicted that continued growth and expansion of Lesser Snow Geese populations was especially likely in the central and western Arctic of Canada (Leafloor *et al.* 2012). The CWS is now considering designating the Lesser Snow Geese nesting in the western Arctic and Ross's Geese as overabundant, as outlined in the following sections of this report.

Notice of Intent to Consider Designation of Western Arctic Lesser Snow Geese as Overabundant

A notice of intent is hereby given that designating the western Arctic population of Lesser Snow Geese (*Chen caerulescens caerulescens*) as overabundant is under consideration. Should CWS decide to proceed with the designation following the conclusion of the consultation process initiated in fall 2012, a proposal will be published in the December 2013 CWS Regulatory Report.

An overabundant population is one for which the rate of population growth has resulted in, or will result in, a population whose abundance directly threatens the conservation of migratory birds (themselves or others) or their habitats, or is injurious to or threatens agricultural, environmental or other similar interests.

Experience has shown that serious habitat loss from the destructive foraging activities of Lesser Snow Geese and Ross's Geese occurred in parallel with very rapid population growth in the central and eastern Arctic (Batt 1997). Some localized habitat damage has already occurred on Banks Island from the foraging activities of western Arctic Snow Geese (Hines *et al.* 2010). If the western Arctic population continues to increase at the present rate, the negative impacts to habitat and other species are predicted to expand.

The western Arctic population breeds primarily on Banks Island, Northwest Territories, with smaller breeding colonies on the mainland of the Northwest Territories and Alaska. The population migrates mainly through Alberta and western Saskatchewan in spring and autumn. The majority of birds winter in

the Pacific Flyway, mostly in California where they mix with the Wrangel Island population of Lesser Snow Geese and Ross's Geese. Some birds also winter in the western Central Flyway, where they mix with mid-continent Snow Geese.

Western Arctic Snow Geese are already well above the spring population objective of 200 000 birds (NAWMP 2012). Photographic surveys of the nesting colonies indicate that the number of nesting birds has grown from about 171 000 adults in 1976 to about 500 000 adults in recent years (Kerbes et al. 1999b; Hines et al. 2010; CWS, unpubl. data). The fall estimate of western Arctic/Wrangel Island Snow Geese in the Pacific Flyway was over 1 million birds in 2011; this has increased an average of 6% per year from 2003 to present (USFWS 2013). Increases also have been observed in the western Central Flyway population of Snow Geese (USFWS 2013).

Based on band return data, adults from the western Arctic population have an 85% chance of surviving from one year to the next (CWS, unpubl. data). This survival rate is high and similar to estimates of other increasing white goose populations. Recent recovery rates for banded adult birds were only 2–3%, suggesting that non-hunting mortality is currently more important than hunting mortality (CWS, unpubl. data). Increased survival is thought to be mainly due to increased agricultural food supplies, increased use of refuges during migration and winter, and reduced harvest rates by hunters (Abraham et al. 1996; Abraham and Jefferies 1997).

The western Arctic population is showing a pattern of rapid population growth similar to that which has been observed in other populations of Snow Geese and Ross's Geese. For this reason, it is important to consider implementation of special conservation measures, such as spring harvest, before the western Arctic population reaches a level that cannot be controlled through increased harvest by hunters. Similar efforts to stabilize Greater Snow Goose numbers in eastern North America were successful because the population was still small enough that it could be controlled through increased harvest (Reed and Calvert 2007). Based on experience with the mid-continent population of Lesser Snow Geese and Ross's Geese, it is likely easier to recover goose populations that reach low levels than to reduce them after they experience runaway growth (Leafloor et al. 2012). It may still be possible to stabilize the western Arctic population if liberalized harvest measures are implemented soon. Designation of the western Arctic population as overabundant would provide tools to liberalize harvest under special conservation measures such as spring harvest, use of electronic calls or baiting.

Notice of Intent to Consider Designation of Ross's Geese as Overabundant

A notice of intent is hereby given that designating the Ross's Geese (*Chen rossii*) as overabundant is under consideration. Should CWS decide to proceed with the designation following the conclusion of the consultation process initiated in fall 2012, a proposal will be published in the December 2013 CWS Regulatory Report.

An overabundant population is one for which the rate of population growth has resulted in, or will result in, a population whose abundance directly threatens the conservation of migratory birds (themselves or others) or their habitats, or is injurious to or threatens agricultural, environmental or other similar interests.

Following publication of the Ecosystems in Peril report (Batt 1997), unprecedented management actions were initiated in 1999 to reduce damage caused to arctic and subarctic ecosystems by the foraging activities of increasing numbers of Lesser Snow Geese (*Chen caerulescens*) and Ross's geese (*Chen rossii*; Batt 1997; Moser 2001). Most of these actions were aimed at reducing survival of adult geese through increased harvest by hunters throughout the range of the mid-continent population, which was thought to be the most efficient means of reducing population size (Rockwell et al. 1997). Hunting regulations were liberalized during regular seasons, traditional hunting restrictions (e.g., prohibition on use of electronic calls, requirement for plugged shotguns, bag and possession limits) were relaxed or removed to promote increased harvest, and habitat management regimes on some refuges were altered to increase exposure of the birds to hunting outside of refuge areas. Additional amendments to the migratory bird regulations in Canada and the United States were made to allow conservation harvests of such overabundant species outside of hunting seasons.

Though most attention was focused on overabundance of Lesser Snow Geese, Ross's Geese were designated as overabundant in the United States in 1999, and have been included in regulations allowing spring conservation harvests there ever since. In Canada, a court decision in 1999 determined that overabundance regulations could not be applied to Ross's Geese because it had not been demonstrated that they were contributing to the habitat damage.

It is now clear that Ross's Geese contribute to habitat degradation on nesting and staging areas where they occur in large numbers (Alisauskas et al. 2006b; Abraham et al. 2012). Like Lesser Snow Geese, Ross's Geese grub during nest building and during spring staging, when a large portion of their

diet is made up of the roots and rhizomes of sedges and grasses (Ryder and Alisauskas 1995). Alisauskas et al. (2006b) found that vegetative cover was removed in areas occupied by nesting Ross's Geese, resulting in exposure of mineral substrate and peat. This led to reduced vegetative species richness that worsened over time, particularly in low-lying habitats preferred by Ross's Geese for nesting. Reduced graminoid abundance caused by foraging of geese has also led to dramatic declines in small mammal abundance around dense nesting colonies (Samelius and Alisauskas 2009). Didiuk et al. (2001) suggested that use by Ross's Geese of nesting areas previously degraded by Lesser Snow Geese (e.g., on the west coast of Hudson Bay) may slow recovery of those areas due to the ongoing effects of foraging and nest building. The smaller bill morphology of Ross's Geese may allow them to crop vegetation more closely to the ground than do Lesser Snow Geese, adding to the intensity of grazing.

Ross's Geese are closely related to Lesser Snow Geese, and co-occur with the latter species throughout the year; their behavioural and morphological similarity has led to harvest management of the two species in aggregate since 1978 (Moser and Duncan 2001). In the mid-1960s, most Ross's Geese (>90%) nested in the central Arctic of Canada, and wintered in the Central Valley of California (Melnychuk and Ryder 1980). Though comprehensive estimates of population size were not available until recently, photographic surveys of known nesting areas indicated fewer than 100 000 nesting Ross's Geese in the mid-1960s (Kerbes 1994). The continental population objective for Ross's Geese has been 100 000 birds since the inception of NAWMP in 1986. By the mid-2000s, Ross's Geese had expanded their range eastward on both nesting and wintering areas (Alisauskas et al. 2006a), and the population was estimated to number between 1.5–2.5 million adult birds (Alisauskas et al. 2009, 2011, 2012), despite efforts to stop the growth of the population through increased harvest by hunters.

Alisauskas et al. (2006a) analyzed hunter recoveries of Ross's Geese captured and marked in the Queen Maud Gulf region of the central Canadian Arctic, and found that survival of adults had declined during the period 1994–2000, reaching a low of approximately 0.80, apparently in response to concurrent increases in harvest. The authors noted, however, that during this same time period, the Ross's Goose population at one of the largest known breeding colonies in the Queen Maud Gulf region had shown sustained growth, suggesting that an adult survival rate of 0.80 was unlikely to have negative consequence for continental Ross's Goose populations. Since 2001 (the last year that

Alisauskas et al. [2006a] considered), continental harvest of adult Ross's Geese has apparently stabilized, and harvest rates (the annual proportion of the adult population harvested by hunters) have declined to only about 2–3% (Alisauskas et al. 2009, 2012; Dufour et al. 2012). Annual survival of Ross's Geese declined from 0.897 (95% CI = 0.789–0.953) to a low of 0.827 (95% CI = 0.801–0.850) during the period 1989–1997, then increased steadily from 1998 onward, reaching a high of 0.950 (95% CI = 0.899–0.976) in 2009. Notably, this reversal of the survival trajectory occurred in the face of some of the highest annual harvest levels estimated for adult Ross's Geese since 1989 (Alisauskas et al. 2012).

Multiple lines of evidence indicate that Ross's Goose populations have continued to grow, both in the central Arctic and at the continental level (Alisauskas et al. 2009, 2012). Collectively, these observations suggest that, like Snow Geese, increases in harvest of Ross's Geese have been outpaced by concurrent increases in abundance, thereby diminishing the effects of harvest on adult survival (Dufour et al. 2012). In fact, Ross's Goose numbers have continued to increase at a higher rate than have Lesser Snow Geese since the start of conservation actions in 1999, and continued growth of the Ross's Goose population is predicted to occur (Alisauskas et al. 2006a; Alisauskas et al. 2012; Dufour et al. 2012). Thus, the environmental damage being caused, with its effects on other species and ecosystem structure and function, is expected to continue to increase.

Designation of Ross's Geese as overabundant is therefore being considered by the CWS and would provide tools to liberalize harvest under special conservation measures such as spring harvest, use of electronic calls or baiting.

Regulatory Proposal for 2013–2014

The special conservation measures to be implemented in spring 2014 are already made into law. They are posted on the CWS website, at www.ec.gc.ca/rcom-mbhr/default.asp?lang=en&n=a297b56f-1, and are presented in Appendix A of this report.

The regulations proposed to be implemented in the fall hunting seasons of 2014 and the spring conservation measures in 2015 are under development, and will be presented in the December 2013 Regulatory Report.

Ross's Goose

About 95% of all Ross's Geese (*Chen rossii*) nest in the Queen Maud Gulf area of the central Canadian Arctic. Increasing numbers are being

found along the western coast of Hudson Bay, on Baffin, Southampton and Banks islands, at La Perouse Bay, Manitoba, and Cape Henrietta Maria, Ontario (Kerbes 1994; J. Leafloor, pers. comm.; K. Abraham, pers. comm.). Nesting colonies of Ross's Geese are usually interspersed with those of Lesser Snow Geese, so it can be difficult to accurately evaluate the size of Ross's Goose populations using traditional survey techniques. Ross's Geese traditionally wintered mostly in California, New Mexico, Texas and Mexico, but in the past two decades have expanded their range eastward in North America (Alisauskas et al. 2006a).

Ross's Goose was considered a rare species in the early 1900s. When legislation was passed to prohibit hunting in 1931, the estimated population of Ross's Geese was only 5000 to 6000 birds. By 1988, the breeding population had increased to more than 188 000 birds in the Queen Maud Gulf Migratory Bird Sanctuary (Kerbes 1994; Ryder and Alisauskas 1995) and to about 982 000 in 1998 (Alisauskas et al. 1998). Helicopter surveys on Baffin Island, in conjunction with the banding in August, suggested that there were at least 20 000 Ross's Geese present by 2009 (Alisauskas et al. 2012). A new colony of nesting Ross's Geese became established near the McConnell River, Nunavut, in the early 1990s, and it was estimated at more than 70 000 birds in 2003. The colony continued to increase and was estimated at about 90 000 nesting birds in 2005 (J. Caswell, pers. comm.). Information gathered while banding Lesser Snow Geese near Cape Henrietta Maria, Ontario, indicated that the Ross's Goose population there may now be as large as 2250 pairs (Abraham 2002). The largest colony of Ross's Geese is found near Karrak Lake in the Queen Maud Gulf, where an estimated 479 400 birds nested in 2001 (Alisauskas 2001).

A recent analysis by Alisauskas et al. (2006a) described changes in the geographic distribution of Ross's Geese in winter. Over the past decade, the wintering populations and the harvest have shifted eastward, matching the eastward expansion of the breeding populations.

The most recent estimates available suggest that the Ross's Goose population likely exceeds 1.5 million adult birds and is increasing at a faster rate than are mid-continent Lesser Snow Geese in recent years (Alisauskas et al. 2012).

An earlier spring in much of the central Arctic region of Canada likely resulted in improved production for Ross's Geese over 2012. Average nesting conditions also appeared to exist in most of the eastern Arctic in 2013, where anecdotal evidence suggests that Ross's Goose numbers continue to grow (J.O. Leafloor, CWS PNR, pers. comm.). Out of all goose species nesting on western Baffin Island, only Ross's Geese appeared to have

had good production in 2013, based on observations of brood flocks in August.

Greater White-fronted Goose

There are three populations of Greater White-fronted Geese (*Anser albifrons*): mid-continent, Tule and Pacific. The Pacific and Tule White-fronted geese are the two subspecies of White-fronted geese that breed in Alaska and winter primarily in California. In Canada, the population is the mid-continent White-fronted Goose.

In the past, Greater White-fronted Goose surveys were conducted in early spring, but these counts were problematic when geese were too widely spread along their migration route to allow for good counts. As numbers of mid-continent Lesser Snow Geese increased in the important count areas, the surveys became even more problematic and were abandoned in 1992. However, until the early to mid-1980s, the surveys did a good job of tracking the trend in Greater White-fronted Goose numbers, indicating that the overall population grew from the late 1950s to the early 1990s (J. Hines, pers. comm.).

In 1992, a fall survey of the staging areas in Saskatchewan and Alberta was implemented with the objective of providing an annual index of the population size of mid-continent Greater White-fronted Geese. Because it is unlikely that significant numbers of geese are present outside the survey area in most years (based on historical migration and distribution data, as well as experimental surveys), this fall inventory accounts for a significant proportion of the population (Nieman et al. 2001). The survey was not completed in 2013 due to the U.S. government shutdown (the USFWS provides aircraft and pilots). Results for fall 2012 indicated a total of 778 000 geese, which represented a 12% increase over 2011; the 3-year average was 724 000 geese, an increase of 9% (Figure 31; K. Warner, pers. comm.).

Most monitoring programs for mid-continent white-fronted geese suggest that the population has increased significantly in size over the past several decades. Midwinter survey counts increased approximately four-fold between 1969 and 2011 (Figure 31), and indices from regional breeding ground surveys in northern and central Alaska more than doubled from 1986–2012. Likewise, estimates of population size that are derived from harvest estimates and banding data (Lincoln 1930; Alisauskas et al. 2009) show an approximately four-fold increase from 1975 to 2011; the most recent estimates suggest a population size of about 3.5 million adults (Figure 32; R. Alisauskas, unpubl. data). By contrast, fall counts in the Canadian

Prairies have been stable, or perhaps have declined slightly, between 1992 and 2013, but the reasons for this are unclear (Figure 32).

From 2002 through 2011, annual harvest rates of mid-continent adult White-fronted Geese averaged 4.4%, and appear to have declined markedly since the late 1970s, though they have been relatively stable since 1989. Adult harvest rates have exceeded 6% only 4 times since 1989 (in 1992, 1997, 1999 and 2004). Estimated harvests of White-fronted Geese in states of the Mississippi Flyway averaged about 110 000 birds per year from 2002–2011 and appear to have increased over time. Annual harvests averaged about 85 000 birds annually from 2002–2011 in the Central Flyway, and also showed a long-term increase. Combined U.S. harvests of mid-continent White-fronted Geese averaged approximately 67 000 birds per year in the 1970s but increased to about 195 000 birds annually from 2002–2011. Harvests in Canada averaged about 67 000 birds per year from 2002–2011. Almost all of the Canadian harvest occurs in the provinces of Alberta and Saskatchewan, and though estimated harvests have been more erratic in recent years, there has been an increase in harvest in Canada (Figure 33), despite substantial declines in sales of migratory game bird hunting permits. Total mid-continent harvest has clearly increased over time also, averaging approximately 125 000 birds annually from 1975–1979, and 265 000 annually from 2002–2011.

Canada Goose and Cackling Goose

Until recently, *Branta canadensis* geese breeding in Canada were recognized as a single species, despite debate around the validity of this taxonomic clustering (summarized in Dickson 2000). Over the years, many authors suggested that two species should be recognized: small-bodied birds with relatively short necks and bills, and larger-bodied birds with proportionately longer necks and bills (Mowbray et al. 2002). In 2003, after reviewing the genetic evidence, the American Ornithologists' Union identified two species of geese from the one species previously referred to as *B. canadensis* (Banks et al. 2003). Birds of the large-bodied or *B. canadensis* group, consisting of seven subspecies, typically nest in inland and more southerly regions, while the four subspecies of the smaller Cackling Goose (*B. hutchinsii*) more typically breed in tundra habitats (www.sibleyguides.com/?s=cackling).

The many different races of Canada Geese (*B. canadensis*) and Cackling Geese (*B. hutchinsii*) that have part of their breeding range in Canada are grouped into 15 different management populations.

The distribution of Canada Goose and Cackling Goose populations are shown in Figures 34a, 34b and 34c.

Table 15 presents overall harvest estimates for Canada and the United States. However, these numbers are composed of birds from more than one population. Because the surveys cannot differentiate among the different populations of Canada Geese and Cackling Geese, they are inadequate for estimating the harvest level of each population. Partitioning of the harvest requires comprehensive banding programs or analysis of molecular markers. Harvest of Canada Geese and Cackling Geese has been on the rise, with the continental harvest surpassing 3 million annually since 2001. The estimated Canada and Cackling Goose harvest in 2011 was 730 316 geese in Canada, whereas an estimated 2 185 054 of these geese were harvested in the U.S. (Table 15).

North Atlantic Population Canada Goose

Canada Geese belonging to the North Atlantic Population (NAP), which is thought to be primarily composed of the subspecies *B. c. canadensis*, breed in Labrador, insular Newfoundland and eastern Quebec, including Anticosti Island (Figure 34a). The breeding population is surveyed by the helicopter plots of the Eastern Waterfowl Survey. An expanded helicopter plot survey was initiated in 2001 when it became evident that neither the original Eastern Waterfowl Survey nor the fixed-wing transects carried out by the USFWS adequately covered the breeding range of this population. Efforts to integrate data from the two survey platforms are ongoing.

Stratum 2 of the Eastern Waterfowl Survey approximates the breeding range of the NAP. A method for integrating the results of the two survey platforms is currently under development in partnership with the USFWS; in the interim, the data from the helicopter plots only is presented in Figure 35. In 2012, the total of estimated indicated pairs was 43 177 (± 6293), which is above the average of the past decade (42 045; Figure 35).

Efforts to band geese breeding in southern Labrador were initiated in the summer of 2007. Banding operations in 2007 identified the presence of Canada Geese banded as juveniles in several northeastern U.S. states. As has been documented for other Canada Goose populations (see below), the presence of moulting, temperate-breeding migrant geese is a concern in terms of both the accuracy of breeding survey estimates and the potential effects on North Atlantic goose populations due to competition for resources.

The NAP banding programs continued in 2009 and 2011, and in 2012 were broadened in an attempt to band geese breeding on the island of

Newfoundland as well as in Labrador. The insular Newfoundland effort did not prove to be cost effective and was suspended after 2012; however, banding on the breeding grounds in Labrador continued in 2013.

The utility of banding NAP Canada Geese on the breeding grounds is currently under review by program partners to determine if delivery of this program is meeting management needs.

Atlantic Population Canada Goose

Atlantic Population (AP) Canada Geese (composed largely of *B. c. interior*) nest throughout northern Quebec, especially along the shores of Ungava Bay and eastern Hudson Bay. A recent review by Mallory et al. (2005) added locations on Baffin and Somerset islands, Nunavut, that are more northerly than the known breeding range. Eastward across Baffin Bay, Canada Geese breeding in western Greenland appears related to the AP birds, based on measures of morphology and genetic characteristics (Fox et al. 1996; Scribner et al. 2003). AP Canada Geese winter from New England to South Carolina, with the largest concentration occurring on the Delmarva Peninsula (Figure 34a).

A breeding ground survey has been conducted every year in northern Quebec since 1993 to estimate the number of breeding pairs on the Ungava Peninsula (Harvey and Rodrigue 2012). Estimates produced by this survey are not adjusted for visibility bias and thus represent an index to the population. This survey covers the three regions that were shown previously to include the highest densities of nesting geese: the region of inland tundra, the region of flat coastal tundra (coastal Ungava Bay and Hudson Bay) and the region of taiga.

The Ungava survey was not conducted in 2013 due to the same technical issues that grounded aircraft for the Breeding Waterfowl Survey in the Eastern Survey Area. Therefore, we present the results from the 2012 survey. The number of Canada Goose breeding pairs (observed as pairs or single birds, together representing the number of indicated breeding pairs) was estimated at 190 340 (SE = 20 448) pairs in 2012, which was similar ($p = 0.41$) to the 2011 estimate of 216 032 pairs (SE = 23 230; Harvey and Rodrigue 2012; Figure 36). The total population estimate (indicated pairs $\times 2$ + non-breeders) of 871 198 (SE = 93 379) in 2012 was also similar to the 2011 estimate of 980 181 (SE = 104 201). While the breeding pair and total population estimates have both risen nearly five-fold since 1995 (record low level of about 30 000 pairs), caution should be used when interpreting the estimate of total population size, as it includes breeding pairs, non-breeders, failed breeders and

moulting migrants from other areas. Harvey and Rodrigue (2009) noted that the difference in density of breeding pairs has become much more obvious since 2001, with the Hudson Bay coast now supporting more than 4 times the density of breeding pairs as the Ungava Bay coast. This could be related to a number of factors, including differential survival or productivity rates. Regardless, the potential for growth appears to be more limited for geese nesting along the Ungava Bay coast (Harvey and Rodrigue 2011). In 2012, the approach used to estimate the abundance of the AP Canada Geese was revised. The previous approach, using a stratification based on ecological zones, was replaced by a stratification based on breeding pair density. Estimates for previous years (1994–2011) were recalculated using the new stratification, so they are not comparable to those in previous years (Harvey and Rodrigue 2012).

In 1997, a pre-season banding program was initiated for AP Canada Geese breeding on the Ungava Peninsula, along the northern Hudson Bay coast and along the south and west coasts of Ungava Bay. Field crews captured and banded 858 adults and 1 241 goslings (total 2099 geese) along Ungava Bay and 839 adults and 801 goslings (total 1640 geese) along Hudson Bay in 2013, for a total of 3739 geese. The preliminary Immature:Adult ratio in the catches was 1.2, slightly lower than the long-term average (1997–2012) of 1.44. This result indicates that productivity of AP Canada Geese from the Ungava Peninsula in 2013 was below average.

In the boreal forest, Canada Geese are counted as part of the Eastern Waterfowl Survey. Estimates for the recent decade (1999–2008) clearly remain above those for the 1990–1998 period. The region covered by the Eastern Waterfowl Survey is at the southern limit of the nesting range of AP Canada Geese.

Temperate-breeding Canada Geese in Eastern Canada

This population of Canada Geese nests in southern Ontario, southwestern Quebec, New Brunswick, Nova Scotia and Prince Edward Island. There is also a growing population in New Brunswick, Nova Scotia and Prince Edward Island, following deliberate re-establishment of local Canada Goose flocks beginning in the late 1960s. Though sometimes referred to as "resident," many migrate as far north as James and Hudson bays in Ontario and to northern Quebec during the moulting period, and some winter as far south as Virginia. In turn, an increasing number are remaining to overwinter in southern Ontario (Dennis et al. 2000). In addition to the growing numbers breeding in Canada, temperate-breeding Canada Geese in the

eastern United States have also increased rapidly, and large numbers of subadults and failed breeders move to Canada for the moulting period.

As recently as 1970, Canada Geese did not commonly nest in southern Ontario. However, results of the Southern Ontario Waterfowl Plot Survey show that the population south of the French and Mattawa rivers has grown since the 1970s to just over 83 000 pairs (5-year average since 2009; Figure 37). Increasing at a rate of 9.4% annually from 1971 to 2013, population growth has slowed down, with an average annual increase of 1.9% since 2003 (Table 1a). A relatively small but increasing number of geese also breed north of the surveyed area but south of the range of Ontario's two sub-arctic breeding populations. The 2013 fall flight for the Ontario temperate-breeding population is estimated to be around 500 000 individuals. In 2013, 3525 temperate-breeding Canada Geese were banded in southern and central Ontario.

In southern Quebec, the 2010 estimates along the shoreline of the St. Lawrence River was 900 indicated breeding pairs, and the 2012 estimates in the St. Lawrence lowlands was 2100 pairs (C. Lepage, unpubl. data). The species has expanded rapidly into southwestern Quebec since 2004, with an increasing trend of 4.4% annually along the St. Lawrence shoreline (2004–2010) and 8.2% in the lowlands (2004–2012; Table 1b).

Contemporary estimates of breeding effort in Maritime Canada (as derived from the Eastern Waterfowl and Agricultural Landscape survey plots) suggest an average of roughly 6200 indicated breeding pairs broadly distributed across the region in spring, with the highest densities found in agricultural areas. Banding operations initiated in Maritime Canada in 2007 continued through 2013 in an attempt to assess the contribution of this population to overall goose harvest in the region. Approximately 3000 Canada Geese have been banded in the Maritimes in the past 7 years.

Southern James Bay Population Canada Goose

The Southern James Bay Population (SJBP) is composed of Canada Geese of the subspecies *Branta canadensis interior*, which nest on the southwestern James Bay coast and interior lowland muskeg of Ontario and on Akimiski Island, Nunavut. This population winters in an area extending from southern Ontario, Michigan and Ohio to Mississippi, Alabama and South Carolina (Abraham et al. 2008; Figure 34a). Monitoring of the SJBP includes spring population surveys, ground searches for nests and banding, all of which contribute essential information for management of this population.

The spring population has been surveyed annually since 1990, and there has been no real

change in its size since the survey began. The total spring population in 2013 was estimated at 64 081 (50 519 to 77 643) Canada Geese, which is lower than the 2011 and 2012 estimates (98 900 and 94 943 geese, respectively; Brook and Hughes 2013a; Figure 38).

The 2013 estimate of 60 856 (SE = 6 758) breeding birds (number of indicated breeding pairs \times 2) for Akimiski Island and the mainland was lower than in 2012 (77 503). However, there was no significant change detected when comparing indicated breeding pair numbers (by transect) between 2013 and the previous 5-year average on Akimiski Island or for the mainland. The 2013 estimate was above the threshold level of 50 000 birds, at which changes to harvest regulations would be considered (Brook and Hughes 2013a). Spring phenology was much later than in 2012 and compared with the short-term (5-year) average but was more similar to the long-term average.

Nesting studies in 2013 on Akimiski Island indicated higher nest density than in 2012 and higher than the 2008–2012 average. Nesting success (78.3%) was higher than 2012 and the 2008–2012 period (Bennett et al. 2013).

In July 2013, 2919 Canada Geese were banded along the southwestern coast of James Bay and on the northern coast of Akimiski Island. The ratio of goslings to adults among geese captured was 1.70. Large numbers of moult-migrant temperate-breeding Canada Geese move to Akimiski Island and to coastal areas of James and Hudson bays. In 2013, 297 temperate-breeding moult-migrant Canada Geese were captured and banded on the SJBP breeding range (Hagey et al. 2013). On breeding areas, they may compete for food resources with SJBP goslings and, as a result, contribute to the high gosling mortality that is observed on Akimiski Island in some years.

Mississippi Valley Population Canada Goose

The Mississippi Valley Population (MVP) of Canada Geese (*B. c. interior*) is bounded between the Eastern Prairie population to the west and the SJBP to the east. This population nests in northern Ontario, principally in the Hudson Bay Lowlands, west of Hudson and James bays, and winters in southern Illinois, southern Indiana, western Kentucky and western Tennessee. Monitoring of the MVP includes spring population surveys, ground searches for nests and banding, all of which contribute essential information for management of this population.

Spring phenology was later in 2013 compared with the 5-year average and more comparable to the long-term average. Snowmelt and river breakups were later than 2012 and also more similar to the

long-term average (Brook and Hughes 2013b). The estimated 2013 breeding population of 319 693 (SE = 40 004; number of indicated breeding pairs \times 2) was approximately 16% higher than in 2012 (268 840) but was approximately 10% below the 1989–2012 average of 353 396 breeding birds. Numbers of flocked birds observed were near average, but fewer were counted than in 2012. Surveys indicated a total population of 390 657 (278 755 to 502 559) Canada Geese, which was below the 2012 estimate of 402 844 but above that of 2011 (300 208; Figure 39; Brook and Hughes 2013b).

In 2013, nest monitoring at Burntpoint Creek found more total nests (333) than in 2012, which is above average breeding effort than in the previous few years. Nest density was higher than the previous 5 years and third highest since monitoring started in 2001. Total nest success was approximately 79.6%, which is considerably higher than in 2010 (29.5%), 2011 (37.2%) and 2012 (45.9%; Bennett et al. 2013).

In July 2013, 4122 Canada Geese were banded on the coast of western James Bay north of Attawapiskat and the Ontario coast of Hudson Bay. The ratio of goslings to adults among geese captured was 2.70. Also, 213 temperate-breeding moult-migrant Canada Geese were banded on the coast of western James Bay north of Attawapiskat and on the Hudson Bay coast (Hagey et al. 2013).

Eastern Prairie Population Canada Goose

This Canada Goose population (*B. c. interior*) nests in the Hudson Bay lowlands of Manitoba. The birds overwinter in Manitoba, Minnesota and Missouri (Figure 34b). Spring surveys of Eastern Prairie Population (EPP) Canada Geese have been flown annually since 1972, providing good baseline data for this population.

The 2012 survey estimate of single and paired EPP geese was 116 300 (99 300–133 300), 13% lower than last year's estimate of 133 100 (113 500–152 700, $p = 0.205$). The 2012 spring total population was estimated at 262 500 (227 400–297 600), 36% higher than the 2011 estimate of 192 900 (168 600–217 200, $p = 0.001$; USFWS 2012; Figure 40).

Most Canada Geese that nest in prairie/parkland/boreal habitats of the Prairie provinces and Northwest Territories are monitored annually through the WBPHS (Figure 6). Historically, Canada Geese in this region were divided into several units for harvest management purposes: Western Prairie/Great Plains Population, Hi-Line Population, and the Rocky Mountain Population (Figures 34b, c). As temperate-nesting populations of Canada Geese in the United States and Canada

have grown and expanded, the need for such subdivisions has declined, and instead we report on trends observed in Prairie Canada (strata 26–40) and western boreal regions of the WBPHS (Strata 12–25, 50, 75–77; Figure 6).

Canada Geese in prairie strata of western Canada averaged approximately 73 000 birds annually from 1970–1979 but grew to 652 000 birds annually from 2004–2013 (Figure 41). Boreal strata in western Canada have been consistently surveyed only since 2000. Numbers of Canada Geese in these strata averaged about 234 000 birds annually from 2000–2013, and recent estimates appear to be increasing (Figure 41). Overall, numbers of Canada Geese have increased over time in all 3 Prairie provinces and in the Northwest Territories.

Pacific Population Canada Goose

The Pacific Population (PP) of Canada Geese nests and winters west of the Rocky Mountains from northern Alberta and B.C. south through the Pacific Northwest to California (Figure 34c). In Canada, this goose population breeds in central and southern British Columbia and comprises both migratory and non-migratory (resident) segments.

Breeding Pacific Canada Geese are surveyed in the course of the WBPHS and two major surveys are used to estimate trends in duck populations in British Columbia: the large-scale (11-million-hectare) aerial survey of the B.C. Interior, and the replicated series of ground counts covering selected wetlands of the Southern and Central Interior Plateau of B.C. Ground counts were modified in 2007 to focus on managed and protected wetlands. The estimate of the PP in 2012 was 221 600 geese, 11% higher than the prior year's count of 200 000 (USFWS 2013).

The Waterfowl Breeding Population Survey of the British Columbia Central Interior Plateau has tracked the PP of Canada Geese since 2006. CWS analyses estimated the presence of 29 823 individuals in the Central Interior Plateau in 2013, 25% fewer than in 2012. The non-migratory segment is concentrated in the urban and suburban areas of southwestern British Columbia (particularly the Greater Vancouver and Greater Victoria areas) and nearby agricultural lands (A. Breault, pers. comm.).

Problem populations of resident and urban Canada Geese are primarily controlled by municipalities and through federal hunting regulations. Key management practices include egg adding (operational in the lower mainland of B.C. for over 10 years), prevention of nesting, landscape management and relocation of moulting flocks to areas where they can be subjected to hunting mortality. Split hunting seasons have been successful in increasing the number of Canada Geese harvested in some agricultural areas, and

special permits are issued to protect crops and property (A. Breault, pers. comm.).

Mid-continent Cackling Goose

In 2004, the American Ornithologists' Union recognized Cackling Geese (*Branta hutchinsii*) as a separate species from Canada Geese (*Branta canadensis*; Banks et al. 2004). The two species are similar in appearance, but Cackling Geese are generally much smaller, nest mainly in arctic tundra and coastal habitats, and can be definitively distinguished from Canada Geese based on mitochondrial DNA. The mid-continent population of Cackling Geese includes all Cackling Geese nesting north of the tree line in Canada (Figure 42) and wintering mainly in the Central and Mississippi Flyways. According to band recovery data, birds banded in the westernmost nesting areas generally winter farther west than those from the central nesting areas; those from the central nesting areas winter, in turn, farther west than those from the easternmost nesting areas (Figure 43). Cackling Geese nesting in the central and western arctic are most commonly recovered in eastern Alberta, western Saskatchewan and western portions of the Central Flyway. Those nesting in the western Hudson Bay region between about 75–95°W longitude are mainly recovered in eastern Saskatchewan, southwestern Manitoba and eastern portions of the Central Flyway. Cackling Geese nesting on Baffin Island are recovered in southern Manitoba and in nearly equal proportions in the eastern Central Flyway and western Mississippi Flyway. Few Cackling Geese are recovered in the eastern Mississippi Flyway or in the Atlantic Flyway.

Until recently, Cackling Goose population size had not been estimated on either the breeding or wintering grounds, though trends from midwinter counts and local breeding ground counts suggested that the population was stable or increasing. For example, on western Baffin Island annual helicopter transect surveys were flown in August, from 1996 through 2009. The estimated number of Cackling Geese that occupied the Great Plain of the Koukdjuak on Baffin Island ranged from about 124 000 to 202 000 birds, and averaged approximately 160 000 birds, with no apparent trend over that time (Figure 44). Midwinter counts of Cackling Geese in the Central and Mississippi Flyways averaged about 325 000 birds in the 1970s and increased to an average of about 687 000 birds from 2002–2011, inclusive (Figure 45).

Total numbers of Cackling Geese are difficult to estimate on their breeding grounds using traditional survey techniques due to the sheer size of the nesting range, and on their wintering grounds due to intermixing with other White-cheeked (Canada)

Geese. Recently, Alisauskas et al. (2009) suggested that Lincoln's (1930) approach could be used to estimate population size of several species of arctic-nesting geese for which band recovery data and age-specific harvest estimates were available. Looking at trends in population size for all years where sufficient data were available, it appears that mid-continent Cackling Geese have increased markedly since the 1970s based on Lincoln estimates (Figure 46). The population estimates averaged about 368 000 birds from 1975–1979, and about 2.39 million adults from 2001–2010.

Brant

Based on breeding and wintering ranges, as well as on genetic differentiation, there are four distinct populations of Brant (*Branta bernicla*) recognized in North America (Reed et al. 1998b). Compared with most other geese, Brant are more vulnerable to sporadic heavy losses from starvation and periodic nesting failures, because of their strong dependence on specific forage plants and the harsh environments where some populations live. This vulnerability requires careful regulation of hunting and monitoring of the status of populations (Reed et al. 1998b). Reed et al. (1998b) provide a review of the information available on this species in North America.

Atlantic Brant

This population of the subspecies *B. b. hrota* nests around Foxe Basin in the eastern low Arctic. It winters along the Atlantic Coast from Massachusetts to North Carolina (Reed et al. 1998b). The 2013 mid-winter population estimate for Atlantic Brant was 111 800, 25 % lower than the 2012 estimate of 149 200 (Figure 47). The population estimates have shown no trend during the past decade (USFWS 2013).

Eastern High Arctic Brant

This group of *B. b. hrota* breeds on islands of the eastern high Arctic, migrating via Greenland and Iceland to winter in Ireland (Reed et al. 1998b). There are no surveys currently conducted on the Canadian breeding grounds, and little information is available about the distribution within breeding range. The number of Eastern High Arctic Brant is estimated through counts on the staging areas in Iceland and the wintering grounds in Ireland, where the population grew from fewer than 10 000 birds in the late 1960s to more than 33 000 in 2004–2005. Results of the 2012 International Census estimated a population of about 42 000 geese, a 10% increase

from 2010 (Wildfowl and Wetlands Trust 2013).

The percentage of young is also assessed during the fall census. As is the case for most arctic birds, productivity fluctuates markedly between years: only 1–2% of the population is composed of young birds in poor years, with the percentage increasing to as high as 20–30% in good years. The 2012 season was a poor production year with young making only 1.9% of the fall population (Wildfowl and Wetlands Trust 2013).

Black Pacific Brant

Pacific Brant include Black Brant (*B. b. nigricans*) and Western High Arctic Brant, also known as Grey-bellied Brant.

Black Brant nests in the central and western low Canadian Arctic, Alaska and western Russia. It winters along the Pacific Coast, but mainly in Mexico (Reed et al. 1998b). The mid-winter index for Black Brant was 146 846 in 2013, 7% higher than in 2010 when the full survey was last completed (Figure 48; Olson and Trost 2013). Note that Black Brant numbers are obtained by subtracting Pacific Brant counts in Washington State from the total mid-winter counts in the Pacific. Black Brant counts could nevertheless include an unknown proportion of Western High Arctic Brant.

There are no regular surveys of their breeding grounds, but aerial surveys of Black Brant were conducted in June 1995–1998 in the Inuvialuit Settlement Region. The results suggested that the total population of the Mackenzie Delta, Tuktoyaktuk Peninsula and Liverpool Bay likely exceeded 6000 birds (Hines and Wiebe Robertson 2006). Preliminary mark-recapture and band-recovery estimates suggest that survival rates of adult brant are relatively high (J. Hines, unpubl. data).

Part of the Black Brant population stages along the coast of British Columbia during spring migration. It is estimated that 3000 to 7000 brant stopover in the Queen Charlotte Islands on their way to northern breeding grounds. Roughly 25 000–30 000 Black Brant stage in the Strait of Georgia, B.C., with the Fraser River delta and the Parksville-Qualicum area on Vancouver Island being the 2 most important sites. A statistical model was developed to estimate the volume (total number) of birds moving through the Strait (Hagmeier 2002; Hagmeier et al. 2008).

Historically, between 1000 and 10 000 brant spent the winter in British Columbia. More recent estimates of the wintering population in B.C. indicate that approximately 2500 individuals are found in 3 major wintering locations: the Fraser River Delta (2000+ birds), the Queen Charlotte Islands (200+ birds) and Vancouver Island (100+ individuals; A. Breault, unpubl. data). In the areas of Boundary Bay

and Robert's Banks of the Fraser River Delta, the wintering Brant population has been generally increasing since 1992. The British Columbia peak winter population was estimated at 2204 brant during the winter of 2013, a 79% increase over the 1229 birds observed in the winter of 2012 (Breault, pers. comm).

The Western High Arctic Brant is intermediate in appearance between *B. b. nigricans* and *B. b. hrota*, and it is thought by some biologists to be a unique subspecies. It breeds on islands of the western High Arctic and winters mainly in Puget Sound, Washington (Reed et al. 1998b). Mid-winter counts suggest relatively large historical fluctuations in the population size of Western High Arctic Brant (Figure 48). Although Western High Arctic Brant intermix with Black Brant during fall migration and winter, a useful index to population size is the mid-winter count from Washington state, where most of the population is thought to winter. There were 16 454 brant counted in that State in 2013, 6% fewer than in 2012 (17 502; Olson and Trost 2013). This estimate also includes an unknown number of Black Brant.

Western High Arctic Brant are of management concern given their limited number, potentially unique subspecies status and restricted winter distribution. In 2005, Western High Arctic Brant were satellite-tagged on their moulting grounds in the Arctic. The resulting data were used to map southward and northward migration routes, timing of migration, important staging sites, and habitat use patterns at Izembek Lagoon, Alaska, an important fall staging site (these results are to be published soon in a special Wildfowl proceedings). In addition to marking birds, blood samples were taken to test the degree of genetic distinctiveness of the Western High Arctic Brant from other brant stocks breeding and wintering in North America. DNA lab analyses have been completed, and the results will be published soon (S. Boyd, pers. comm.).

Population Status of Swans

Two species of swans are native to Canada: the Tundra Swan (*Cygnus columbianus*) and Trumpeter Swan (*C. buccinator*).

Tundra Swan

Eastern population

There are two management populations of Tundra Swans. The western population breeds along the coastal lowlands of western Alaska and migrates through western Canada and along the Pacific Coast. This population winters primarily in

California, Utah and the Pacific Northwest. The eastern population of Tundra Swans breeds from the Seward Peninsula of Alaska to the northeast shore of Hudson Bay and Baffin Island, and migrates through the Prairie provinces and Eastern Canada. This population winters in coastal areas from Maryland to North Carolina along the mid-Atlantic coast, as well as in the lower Great Lakes.

The 2013 mid-winter survey of Eastern Population Tundra Swans observed 107 100 swans (swans counted in Ontario and the Atlantic and Mississippi flyways), similar to the 2012 count of 111 700 and showing stability in the population over the last 10 years (USFWS 2013).

The Mackenzie Delta region and nearby parts of the Western Arctic mainland are one of the most important breeding areas for Tundra Swans in North America and support about one-third of the Eastern Population of this species.

The number of individuals from the Eastern Population killed and retrieved in the U.S. in 2012 was 3555, similar to the previous year's harvest (Klimstra and Paddling 2013). There are no open seasons for Tundra Swans in Canada.

A migration study using satellite transmitters placed on Tundra Swans captured on Lake Erie (Petrie and Wilcox 2003) demonstrated that eastern Tundra Swans migrated between the wintering areas on the Atlantic coast and staging points in the northern Prairies along a narrow corridor passing through the southern Great Lakes. From there, three major routes were followed to breeding areas in western Hudson Bay, the central High Arctic and the Mackenzie River Delta. To see the migration routes taken by the swans, visit the following website: www.bsc-eoc.org/research/lpwwrf/index.jsp?lang=EN&targetpg=lpwwrfTUSWtrack.

Western population

The western population of Tundra Swans is counted on its wintering areas. The 2013 estimate of the western population of Tundra Swan was 107 100 birds (USFWS 2013). This count was 9% lower than the 2012 estimate. The harvest of western Tundra Swans in 2012 was estimated at 1369 birds, which represents a 16% increase from 2011 (Olson and Trost 2013).

Trumpeter Swan

There are three management populations of Trumpeter Swans in North America (Figure 21): the Pacific Coast Population, the Rocky Mountain Population and the Interior Population. The size of each of those populations is assessed at 5-year intervals across their entire breeding range in North

America. The first survey in 1968 estimated the population at 3722 Trumpeters. The most recent survey completed in 2010 estimated the population at 46 225 birds, with each of the 3 populations achieving record-high abundance estimates. Cygnets accounted for approximately 26% of the total population, indicating good production of young. The population has been increasing at an annual growth rate of 6% since 1968 (Groves 2012).

In previous surveys, the Pacific Coast Population range in Canada and part of the Rocky Mountain Population range in Canada (Yukon, north-central/northwestern British Columbia) were surveyed using a sampling procedure, and in the remainder a total count was attempted. Because of their increasing abundance and expanding breeding range, in 2010, for the first time, the entire Canadian breeding range of the Pacific Coast Population and Rocky Mountain Population (excluding some very sparsely occupied regions of northern Yukon and north-central British Columbia) was surveyed using a stratified random sampling procedure. The survey used 1:50 000 topographic maps as sample units. A total of 185 maps were surveyed by aircraft in Yukon, British Columbia, Alberta and the Northwest Territories (Figure 21). The Pacific Coast Population in western Yukon and northwestern British Columbia grew 17% from 1236 to 1443. The Canadian portion of the Rocky Mountain Population is now estimated at 8950 ± 1631 (95% CI), based on extrapolation from 4150 swans observed during the survey. This estimate is up 90% from 4718 in 2005. All Canadian areas of the Rocky Mountain Population showed growth since the 2005 survey, ranging from 17% in Yukon to over 150% in Alberta. The change in survey methodology is thought to be responsible for some of the apparent increase in the Rocky Mountain population in British Columbia, Alberta and the Northwest Territories; previous surveys in these areas were likely underestimating the population.

Small numbers of Trumpeter Swans of the Pacific Coast Population are also encountered in the annual Yukon Roadside Waterfowl Breeding Population Survey. The results show significant increases over the past 5, 10, 15 and 21 years (Figure 24).

In Canada, the Interior Population breeds primarily in Ontario, but small numbers have become established in western Saskatchewan and adjacent Manitoba. The last formal survey for this population in Saskatchewan/Manitoba was conducted in Riding Mountain National Park in 2010, where 49 swans were recorded, up from 30 in 2005 (Parks Canada, unpubl. data). In Ontario, a re-introduction program which begun in 1982 had, by 2005, achieved its goal of at least 500 free-living swans (H. Lumsden, unpubl. data). Surveys in Ontario conducted in 2005 as part of the continental 5-year survey showed a

total population of 644 swans in Ontario (Moser 2006). The captive-breeding and release program ended in 2006. The known current (2010) summer distribution in Ontario is shown in Figure 21. The southern Ontario flock has continued to grow, and in 2010, 839 swans were estimated based on winter counts: observed cygnets at all wintering sites were added to an estimate of the adult and subadult population derived from mark/recapture calculations using wing-tagged birds (H. Lumsden, unpubl. data). Breeding Trumpeter Swans have now also become established in northwestern Ontario. In summer 2010, as part of the 5-year continent-wide monitoring program, several aerial surveys and some other observations yielded a total of 274 birds in regions west and north of Thunder Bay. Another flock has become established in eastern Ontario, numbering at least 54 in summer 2010 (H. Lumsden, unpubl. data).

During the winter period, over 40% of the Pacific Coast Trumpeter Swan population is present on the coastline, wetlands and agricultural fields of Vancouver Island and the Fraser River Valley in British Columbia; this is the largest wintering Trumpeter Swan concentration in North America. Aerial surveys of the area's wintering population have been conducted every 3 years over this entire area, to identify regional and habitat-specific trends in use of the area by swans. During the most recent survey in January and February 2006, estuaries, coastal marshes, farmland and freshwater lakes were the most important wintering sites on Vancouver Island, and swans were distributed almost equally between tidal marshes and upland habitats in the Fraser River Valley. The survey estimated a total of 7570 swans, an 11.7% increase over the 6775 swans observed in 2000–2001. The mid-winter survey of Vancouver Island and the southwest mainland coast scheduled for winter 2009–2010 was cancelled because of flying restrictions around Vancouver and the Strait of Georgia due to the 2010 Olympics, and it has been permanently cancelled following an internal survey assessment.

Approximately 3000 Trumpeter Swans have died in Washington State and British Columbia since 1999, primarily because of ingestion of lead shot (A. Breault, pers. comm.). International efforts overseen by the Washington Department of Fish and Game and the CWS were initiated in 2001 to locate the source(s) of lead. Telemetry studies identified Judson Lake, on the Canada–U.S. border, as a key site responsible for the lead shot poisoning, and hazing activities have been conducted on the lake since 2009. Hazing activities have decreased but not eliminated swan mortalities. As of March 18, 2013, 175 Trumpeter Swan mortalities were recorded

during the fall 2012–winter 2013 period (L. Wilson, pers. comm.). Lead poisoning was the suspected cause of death for 44 birds, power line collisions for 70 birds, trauma for 23 birds and the cause of death was unknown for the remaining 38 birds. Current plans for 2013–2014 are to continue with the short-term mitigation strategy of using the exclusion area to prevent swans from accessing the portion of Judson Lake containing the highest density of lead shot. The working group is continuing to investigate effective alternate strategies that would provide a longer-term solution.

Population Status of Other Hunted Migratory Birds

Thick-billed and Common Murres

Thick-billed Murres (*Uria lomvia*) and Common Murres (*U. aalge*) have traditionally been hunted off the coast of Newfoundland and Labrador for generations. Although murres are not migratory game birds, when the province joined Canada in 1949, the importance of murre hunting to residents of Newfoundland and Labrador was recognized, and a variety of legislative and regulatory amendments have allowed for the legal harvest of murres in Newfoundland and Labrador (see Chardine et al. 2008 for details). Through the 1970s and 1980s, large harvests (Elliot et al. 1991) necessitated improved hunter education, regulatory changes and enforcement (Elliot 1991). Those efforts appear to have been successful in reducing the harvest from upwards of 750 000 birds to about 250 000 birds harvested annually by the early 2000s (Chardine et al. 1999). Current harvests estimated at less than 100 000 birds are probably well below levels that would compromise population sustainability (using the population model in Wiese et al. 2004). Reduced ice cover appears to lead to reductions in harvest pressure (Gaston 2002a; Gaston and Robertson 2010), so with climate change, reductions in winter ice cover in the future should lead to restrictions in the number available for harvest. Population counts at colonies are indicating that murre populations are healthy, with most colonies showing signs of growth, or at least maintaining themselves (Gaston 2002b; Chardine et al. 2003; Robertson et al. 2004; Regular et al. 2010).

Tracking studies using geolocation tags are showing that many breeding-age murres do not use coastal habitats at all during the winter period, and surprisingly some birds are wintering beyond the continental shelf (Hedd et al. 2011; Gaston et al. 2011). There are differences in wintering areas among birds from various colonies; murres of both

species breeding in Labrador make use of coastal waters more than birds from other colonies, while birds breeding in the High Arctic winter in areas that are exposed to harvests in Greenland. Other colonies, such as those in the low Arctic (Thick-billed Murres on Coats and Digges islands, and Common Murres breeding in insular Newfoundland), spend very little or no time in coastal waters (McFarlane Tranquilla, unpubl. data). These results corroborate previous banding results, which show very few recoveries of breeding-age adults (Robertson et al. 2006).

Overall, Thick-billed and Common Murres are doing well in the northwest Atlantic. Current levels of harvest, even when coupled with other sources of mortality such as chronic oiling (which also appears to be declining; Wilhelm et al. 2009), are probably not at levels sufficient to affect the population. However, recent surveys of the major Common Murre colonies along the Labrador coast suggest a long-term decline in colony size for this segment of the population, whereas sympatric colonies of Thick-bill Murres appear to be stable, and Razorbill Auks appear to be increasing in size over the same period. Causes for the decline in Common Murres are not known, and future management actions may be required if the decline continues.

In contrast to the northwest Atlantic, many murre populations are not faring well globally, as this species responds poorly and dramatically to shifts in climate and disruptions of its food web (Irons et al. 2008). Therefore, continued monitoring of this species in Canada will continue to determine whether environmental conditions remain favourable so that murre populations and harvests are sustainable.

In 2011, 52 875 murres were estimated to have been harvested in Newfoundland and Labrador, which is 20% less than the 2011 estimate (Gendron and Smith 2013) but significantly lower than the estimated sustainable level of 250 000 birds.

American Woodcock

The status of American Woodcock (*Scolopax minor*) in North America is monitored through the Singing-ground Survey, which consists of a spring count of male courtship displays at dusk. Counts of singing males provide indices to American Woodcock populations and can be used to monitor annual population changes (Cooper and Rau 2013). The survey covers the central and northern portions of the woodcock breeding range. Analyses of band recoveries indicate that there are two relatively discrete populations, and as a result, American Woodcock are managed on the basis of two regions: Eastern and Central. In Canada, woodcock breeding

in Manitoba and Ontario belong to the Central Population, while those breeding in Quebec and the Maritimes are part of the Eastern Population.

Population indices for short-term, 10-year and long-term (1968–2013) trends were estimated using hierarchical modelling methods (Sauer et al. 2008 in Cooper and Rau 2013). The number of woodcock heard singing during the 2013 survey was not significantly different from last year for both management units. Also, there was no significant 10-year trend for woodcock heard in the Eastern or Central Management Regions during 2003–2013. However, there were significant long-term declines in the breeding populations in the Eastern and Central Regions (Figure 49; Cooper and Rau 2013).

In Canada, the only significant trends observed in the number of American Woodcock were long-term (1968–2013) declines in Ontario (Cooper and Rau 2013).

The major causes for American Woodcock population declines are believed to be degradation and loss of suitable (early succession) habitat on both the wintering and breeding grounds (Kelley et al. [eds] 2008).

An indirect measurement of recruitment or annual productivity of woodcock breeding populations is derived from age ratios of wings collected from the harvest (Wing-collection Survey). The 2012 recruitment index for the Eastern Region (1.7 immatures per adult female) was equal to the 2011 index and about 0.8% greater than the long-term (1963–2011) regional average of 1.6. In the Central Region, the 2012 recruitment index (1.7 immatures per adult female) was 8% greater than the 2011 index (1.5) and 6% above the long-term regional average of 1.6 (Cooper and Rau 2013).

The harvest of American Woodcock in Canada and the U.S. has been declining over recent decades; this decline, however, was much more pronounced in the U.S. (Figure 50). Now the harvest has stabilized at low levels. In 2012, there were 20 241 woodcock harvested in Canada, 29% below the 10-year average (Figure 50). The number of woodcock hunters in Canada is undergoing a long-term decline, from about 20 000 in the late 1970s to about 2000–3000 at present. In the U.S., the 2012 harvest was estimated at 279 500 woodcock, a decrease from the harvest of 308 700 birds in 2011 and 6% below the 10-year average.

Mourning Dove

Mourning Doves (*Zenaidura macroura*) are among the most widely distributed and abundant birds in North America, and are monitored in Canada through the Breeding Bird Survey (BBS; www.ec.gc.ca/reom-mbs/default.asp?lang=en&n=416B57CA).

The Mourning Dove population has increased significantly since 1970 but has stabilized during the last decade. The Canadian population is estimated to be between 500 000 and 5 million adults. The population has been increasing in Saskatchewan, Ontario, Quebec and the Maritime provinces but declining in British Columbia and Manitoba during the 1970–2011 period. The population was stable in Alberta during that time period. Similarly, there were no significant trends in any provinces over the past decade (2001–2011), except in Manitoba where a significant decline was observed.

In the U.S., Mourning Dove populations are monitored through the Mourning Dove Call-count Survey, which has been developed to provide an annual index of population size during the breeding season. Mourning Doves are managed on the basis of the 3 regions where dove populations are largely independent. These areas are referred to as the Eastern, Central and Western Management Units. Results from the call-count survey (heard) indicated that abundance of doves decreased in all 3 management units during the long term (1966–2012). Over the most recent 10-year period (2003–2012), there was no evidence for a change in Mourning Dove abundance in the Eastern Management Unit, but there was evidence of a decline in the Central and Western Management Units. Over the most recent 2 years, there was no evidence for a change in abundance in any of the management units. The U.S. population of Mourning Doves is estimated at approximately 349 million individuals (Seamans et al. 2013). Dove hunting is permitted in several states in each of the 3 management units in the United States.

In Canada, Mourning Doves have been hunted in British Columbia since 1960, and 2013 marks the first Dove hunting season for Ontario. The harvest in British Columbia varies considerably from year to year, ranging from an estimated high of 5391 doves killed in 1977 to 95 during the 2008 season. An estimated 12 doves were harvested in British Columbia during the 2012–2013 hunting season. The preliminary estimate of harvest in the U.S. for 2012 was 14 490 800 \pm 532 700, a 13% decrease from the harvest of the 2011 season (Seamans et al. 2013).

Wilson's (Common) Snipe

Wilson's Snipe (*Gallinago delicata*) in Canada are monitored through the BBS (<http://www.ec.gc.ca/reom-mbs/default.asp?lang=En&n=416B57CA>). However, that survey was not developed specifically to follow trends for this species, and large portions of its

range are not covered by the survey. Results should thus be interpreted with caution.

Results from the BBS show that Wilson's Snipe populations have increased in Canada since the 1970s. There have been significant increases in Manitoba and Saskatchewan, and declines in New Brunswick, Northwest Territories, Nova Scotia and Prince Edward Island during that period. No long-term trends were observed elsewhere in the country. There were significant increases over the last 10 years in Alberta, Manitoba and Saskatchewan, and significant declines in New Brunswick, Nova Scotia and Prince Edward Island. No short-term trends were observed elsewhere in Canada.

Although there is no accurate estimate of the size of the population, it is estimated to be over 1 million breeding and migrating birds in Canada (<http://www.ec.gc.ca/soc-sbc/oiseau-bird-eng.aspx?sL=e&sY=2011&sB=WISN&sM=c>). The harvest of this species in Canada appears to have stabilized at a low level over the past decade (Figure 51). In 2012, there were 1120 snipe harvested in Canada, half of last year's harvest estimate. The estimated harvest in the U.S. for 2012 was 64 900 birds, which was also half of the previous year's estimate (Raftovich and Wilkins 2013).

Sandhill Crane

The Mid-continent Population of Sandhill Cranes is the largest of all North American crane populations. This population is composed of approximately two-thirds Lesser (*Grus canadensis canadensis*), one-fourth Canadian (*G. c. rowani*), and the remainder Greater Sandhill Cranes (*G. c. tabida*). Mid-continent Sandhill Cranes breed from southern Ontario northwestward through the Arctic and Alaska and into eastern Siberia. This population winters in western Oklahoma, New Mexico, southeastern Arizona, Texas and Mexico.

The Mid-continent Population of Sandhill Cranes is monitored through a spring aerial transect survey at the key staging area in Nebraska. Indices corrected for visibility bias have been available since 1982. They have been relatively stable since the early 1980s. The uncorrected population index in spring 2012 was 756 217 birds, which was a large increase from the previous year but comparable to estimates from 2009 and 2010 (Kruse et al. 2013; Figure 52). The photocorrected 3-year average for 2010–12 was 538 191, which is above the established population-objective range of 349 000–472 000 cranes.

The Canadian hunting season for mid-continent Sandhill Cranes is currently open only in Manitoba, Saskatchewan and the Yukon Territory. The crane harvest in Canada has been quite variable but

trending upward since the 1970s (Figure 53). However, the harvest in both Manitoba and Saskatchewan showed sharp declines in the late 2000s. The overall Canadian harvest of mid-continent Sandhill Cranes was 5041 in 2012, a decrease of 52% compared with last year's estimate (10 431; Figure 53). The harvest of mid-continent Sandhill Cranes has been increasing in the U.S. over the years. In 2012, the harvest increased by 8% to 17 295 compared to the previous year (16 059; Figure 53; Kruse et al. 2013).

The Eastern Population of Sandhill Cranes has rebounded from near extirpation in the late 1800s to over 30 000 cranes by 1996 (Kruse et al. 2013). The Eastern Population is now rapidly expanding in size and geographic range (Case and Sanders 2009). This population breeds in Ontario, Quebec and several Great Lakes states. The USFWS has conducted a survey of the Eastern Population of Sandhill Cranes since 1979 on its major migratory staging areas. The survey occurs during the last week of October each year and provides a fall index of the population. Overall, the survey has documented a long-term increasing trend in the Eastern Population of cranes. The 2012 index was 87 796 cranes, an increase of 21% over 2011 (Kruse et al. 2013). Eastern Population Sandhill Cranes are presently not harvested anywhere within their range. However, the Atlantic and Mississippi Flyway Councils developed a Management Plan for the Eastern Population due to their increasing abundance. This plan sets the guidelines for potential harvest. The State of Kentucky held its second hunting season for Eastern Population Sandhill Cranes in 2012, and 92 cranes were harvested, up from 50 birds in the inaugural season.

In Ontario, staging Sandhill Cranes surveys have been conducted on Manitoulin Island and the north shore of Lake Huron for over a decade. These surveys are coordinated to occur during peak migration. Numbers peaked in October 2009 and since then have fluctuated, likely based on the timing of peak migration and availability of volunteers. During the fall of 2013, a total of 7168 cranes were counted on Manitoulin Island and the North Shore, Greater Sudbury Area and the 2 claybelts in Ontario. A graduate study by Long Point Waterfowl, which is currently concluding, is examining the behaviour and habitat use of cranes along the north shore of Lake Huron. Telemetry data from marked cranes from this study show that these birds overwinter as far south as Florida, but during mild winters, some will tend to overwinter in more northerly states such as Indiana. It is expected that this study will conclude in 2014 (S. Meyer, pers. comm.).

In Quebec, the 2013 population estimate from the Eastern Waterfowl Survey helicopter plots was 5400 indicated breeding pairs. Interestingly, the

Eastern Waterfowl Survey surveys only the southernmost portion of what is thought to be the core breeding area of Sandhill Cranes in Quebec. The 1996–2013 trend in the survey area indicates an increase of 13.4% annually (C. Lepage, pers. comm.).

Band-tailed Pigeon

In Canada, the Band-tailed Pigeon (*Columba fasciata*) is found in forested habitats of coastal British Columbia. This species has a very low reproductive rate of one egg per pair, but some nest twice each season. The BBS provides an annual index to the abundance of the Band-tailed Pigeon since 1970 (www.ec.gc.ca/reom-mbs/default.asp?lang=En&n=0D74F35F-1). Results from the BBS indicate a declining trend in the population over the long term (1970–2011) but not over the last 10 years (2001–2011) in British Columbia.

The Mineral Site Survey, implemented in 2004, was developed as an alternative mechanism by which to understand population trends in Pacific Coast Band-tailed Pigeons (Sanders 2013). The Mineral Site Survey involves a visual count of Band-tailed Pigeons at several mineral sites throughout the population's range (California, Washington state, Oregon and British Columbia). Results from this survey suggest that the abundance of the Band-tailed Pigeon has decreased by 4.7% per year since 2004, but these results are inconclusive (Sanders 2013).

The Canadian hunting season for this species was closed from 1994 through 2001. Population increases in Washington State were primarily responsible for the limited opening implemented in British Columbia in 2001 (where the bag limit was reduced from 10 birds to 5 and the season length reduced from 30 to 15 days). The harvest continues to decline in comparison to the early 1970s, when between 3000 and 5000 were harvested annually. An estimated 12 Band-tailed Pigeons were harvested in Canada in 2012. The estimated total U.S. harvest for 2012 was 13 700 Band-tailed Pigeons, equal to that of 2011 (Raftovich and Wilkins 2013).

American Coot

During the WBPBS, American Coots (*Fulica americana*) are also recorded in the Canadian Prairies. Results of this survey show that American Coot population estimates have fluctuated greatly over the duration of the survey (Figure 54), with a tendency to show an increasing trend. No results are available for this species in 2013, but the 2012 estimate was 106% above the most recent 10-year

average (1 425 737).

The harvest of American Coots in Canada has fallen considerably over time. In 2012 in Canada, the American Coot harvest was estimated at 2268, an increase of 11% from the previous year. The total harvest in the U.S. in 2012 was 208 700, a decrease of 50% from the 2011 harvest estimate of 416 600 (Raftovich and Wilkins 2013).

Rails

Although rails are counted during the BBS, their sometimes secretive nature and infrequent calling means they are likely to be missed during the survey. The results of trend analyses should therefore be viewed with caution (www.ec.gc.ca/reom-mbs/default.asp?lang=En&n=0D74F35F-1). There is sufficient sample size to estimate trends for Virginia Rails (*Rallus limicola*) for the country as a whole during the long-term period (1970–2011) as well as for the last 10-year period (2001–2011). Trends were increasing in Manitoba over the long term and the 10-year period, but there were no significant trends for Ontario. Results for Canada mirror those from Manitoba.

Sora (*Porzana carolina*) long-term population trends were positive in New Brunswick, Nova Scotia, Prince Edward Island and Quebec. Trends are not reliable for the Yellow Rail (*Coturnicops noveboracensis*) or King Rail (*Rallus elegans*) because of relatively low numbers observed or heard during the surveys.

The only province with an open season on hunting rails is Ontario (excluding King Rails and Yellow Rails). Other provinces previously held seasons, but they have been closed in recent years. The collection of harvest data for rails began in 1989 as part of the National Harvest Survey. Since that time, the harvest has been decreasing. None were reported harvested in 2011.

Literature Cited

- Abraham, K. F., R. L. Jefferies, R. F. Rockwell, and C. D. MacInnes. 1996. Why are there so many white geese in North America? Pages 79-92 in *Proceedings of the 7th International Waterfowl Symposium*, Memphis, TN. J. T. Ratti, ed.
- Abraham, K. F., and R. L. Jefferies. 1997. High populations, causes, impacts and implications. Pages 7-72 in Batt, B. D. J. (editor). *Arctic Ecosystems in Peril: Report of the Arctic Goose Habitat Working Group*. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C., and Canadian Wildlife Service, Ottawa, Canada. 126 pp.
- Abraham, K.F. 2002. Record roundup of Ross's Geese. *Ontario Federation of Ontario Naturalists News* 20(3): 1.
- Abraham, K.F., W.A. Phelps and J.C. Davies (eds). 2008. *A Management Plan for the Southern James Bay Population of Canada Geese*. Mississippi and Atlantic Flyway Council Technical Sections. 55 pp.
- Abraham, K. F., R. L. Jefferies, R. T. Alisauskas, and R. F. Rockwell. 2012. Northern wetland ecosystems and their response to high densities of lesser snow geese and Ross's geese. Pages 9-45 in Leafloor, J. O., T. J. Moser, and B. D. J. Batt (editors). *Evaluation of special management measures for mid-continent lesser snow geese and Ross's geese*. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C. and Canadian Wildlife Service, Ottawa, Ontario.
- Alisauskas, R.T., S.M. Slattery, D.K. Kellett, D. Stern and K.D. Warner. 1998. *Spatial and Temporal Dynamics of Ross's and Snow Goose Colonies in Queen Maud Gulf Bird Sanctuary, 1996-1998*. Progress report on numbers of geese and colonies, September 1998. Unpublished report of the Canadian Wildlife Service, Prairie and Northern Region.
- Alisauskas, R.T. 2001. *Nutritional Ecology and Population Biology of Ross's Geese*, 2001. Unpublished report of the Canadian Wildlife Service, Prairie and Northern Region.
- Alisauskas, R.T., J.J. Traylor, C.J. Swoboda and F.P. Kehoe. 2004. Components of population growth rate for White-winged Scoters in Saskatchewan, Canada. *Animal Biodiversity and Conservation* 27(1): 451-460.
- Alisauskas, R.T., K.L. Drake, S.M. Slattery and D.K. Kellett. 2006a. Neckbands, harvest and survival of Ross's Geese from Canada's central Arctic. *J. Wildl. Man.* 70: 89-100.
- Alisauskas, R. T., J. Charlwood, and D. K. Kellett. 2006b. Vegetation correlates of nesting history and density by Ross's and lesser snow geese at Karrak Lake, Nunavut. *Arctic* 59:201-210.
- Alisauskas, R.T., K.L. Drake and J.D. Nichols. 2009. Filling a Void: Abundance Estimation of North American Populations of Arctic Geese Using Hunter Recoveries. Pages 463-489 in D.L. Thomson et al. (eds.), *Modeling Demographic Processes in Marked Populations*. Environmental and Ecological Statistics 3. Springer Science+Business Media.
- Alisauskas, R.T., R.F. Rockwell, K.W. Dufour, E.G. Cooch, G. Zimmerman, K.L. Drake, J.O. Leafloor, T.J. Moser and E.T. Reed. 2011. Harvest, Survival, and Abundance of Mid-continent Lesser Snow Geese Relative to Population Reduction Efforts. *Wildlife Monographs* 179: 1-42; 2011; DOI: 10.1002/wmon.5.
- Alisauskas, R. T. J. O. Leafloor, D. K. Kellett. 2012. Population status of Mid-continent Lesser Snow Geese and Ross's Geese following special conservation measures. Pages 132-177 in J. O. Leafloor, T. J. Moser, and B. D. J. Batt, editors. *Evaluation of special management measures for Mid-continent Lesser Snow Geese and Ross's Geese*. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C. and Canadian Wildlife Service, Ottawa, Ontario.
- Austin, J.E., A.D. Afton, M.G. Anderson, R.G. Clark, C.M. Custer, J.S. Lawrence, J.B. Pollard and J.K. Ringleman. 1999. Declines of Greater and Lesser Scaup Populations: Issues, Hypotheses, and Research Directions. Summary report for the Scaup Workshop, U.S. Geological Survey, Northern Prairie Wildlife Research Center, Jamestown, North Dakota, U.S.
- Badzinski, S.S., K. Ross, K. Abraham, R. Brook, S. Meyer, R. Cotter, and S. Earsom. 2012. *Sea Duck Joint Venture Annual Project Summary for Endorsed Projects FY 2012 - (October 1, 2011 to Sept 30, 2012)*. Project Title: 82. James Bay Moulting Black Scoter Survey.
- Banks, R. C., C. Cicero, J. L. Dunn, A. W. Kratter, P. C. Rasmussen, J. V. Remsen, Jr., J. D. Rising, and D. F. Stotz. 2004. Forty-fifth supplement to the American Ornithologists' Union check-list of North American birds. *Auk* 121:985-995.
- Batt, B.D.J. (ed.). 1997. *Arctic Ecosystems in Peril: Report of the Arctic Goose Habitat Working Group*. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C., and Canadian Wildlife Service, Ottawa, Ontario.

- Batt, B.D.J. (ed.). 1998. The Greater Snow Goose: Report of the Arctic Goose Habitat Working Group. Arctic Goose Joint Venture Special Publication, U.S. Fish and Wildlife Service, Washington, D.C., and Canadian Wildlife Service, Ottawa, Ontario.
- Bennett, K., R.W. Brook, S. Hagey, and K.F. Abraham. 2013. Monitoring Reproductive Success of Southern James Bay and Mississippi Valley Populations of Canada Geese, 2013. Ontario Ministry of Natural Resources, Peterborough, Ontario.
- Boertmann, D. and A. Mosbech. 2002. Molting Harlequin Ducks in Greenland. *Waterbirds* 25: 326-332.
- Bolduc, F., J.-P. Savard and J.-F. Rail. 2011. Consistency in the distribution of moulting scoters and Common Eiders in the Estuary and Gulf of St. Lawrence in 1998 and 2010. Poster presented at the 4th International Sea Duck Conference, Seward, Alaska, September 12-16, 2011.
- Bordage, D. and J.-P.L. Savard. 1995. Black Scoter (*Melanitta nigra*) in The Birds of North America, No. 177 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.
- Brodeur, S., J.-P.L. Savard, M. Robert, P. Laporte, P. Lamothe, R.D. Titman, S. Marchand, S. Gilliland and G. Fitzgerald. 2002. Harlequin Duck (*Histrionicus histrionicus*) population structure in eastern Nearctic. *J. Avian Biol.* 33: 127-137.
- Brook, R.W. and R.J. Hughes. 2013a. 2013 Spring Population Estimates for the Southern James Bay Population of Canada Geese. Unpublished report of the Ontario Ministry of Natural Resources and the Canadian Wildlife Service, Ontario Region.
- Brook, R.W. and R.J. Hughes. 2013b. 2013 Spring Survey Results for the Mississippi Valley Population of Canada Geese. Unpublished report of the Ontario Ministry of Natural Resources and the Canadian Wildlife Service, Ontario Region.
- Brown, P.W. and L.H. Fredrickson. 1997. White-winged Scoter (*Melanitta fusca*) in The Birds of North America, No. 274 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, D.C.
- Calvert, A.M. and G. Gauthier. 2005. Effects of exceptional conservation measures on survival and seasonal hunting mortality in greater snow geese. *Journal of Applied Ecology* 42:442-252.
- Case, D.J. and S.J. Sanders. 2009. Priority Information Needs for Sandhill Cranes. A funding strategy. Association of Fish and Wildlife Agencies, Migratory Shore and Upland Game Bird, Support Task Force, 13 pp.
- Chardine, J., B. Collins, R.D. Elliot, H. Levesque and P. Ryan. 1999: Trends in annual harvest of murre in Newfoundland and Labrador. *Bird Trends* 7: 11-14.
- Chardine, J.W., G.J. Robertson, P.C. Ryan and B. Turner. 2003. Abundance and distribution of Common Murres breeding at Funk Island, Newfoundland in 1972 and 2000. Canadian Wildlife Service Technical Report Series No. 404. Atlantic Region.
- Chardine, J.W., G.J. Robertson and H.G. Gilchrist. 2008. Seabird harvest in Canada. Pages 20-29 in Seabird harvest in the Arctic (F. Merkel and T. Barry, eds.). Circumpolar Seabird Group (CBird), CAFF Technical Report No. 16 CAFF International Secretariat, Akureyri, Iceland.
- Cooper, T.R., and R.D. Rau. 2013. American woodcock population status, 2013. U.S. Fish and Wildlife Service, Laurel, Maryland. 16 pp.
- Cotter, R. 2009. Sea Duck Joint Venture Annual Project Summary for Endorsed Projects FY 2009 – (October 1, 2008 to Sept 30, 2009). Project Title: 2009 Black Scoter Survey of southern Hudson Bay and James Bay, Quebec.
- Dennis, D.G., N.R. North and H.G. Lumsden. 2000. Range expansion and population growth of Giant Canada Geese in southern Ontario: Benefits, drawbacks and management techniques, in K.D. Dickson (ed.), Towards Conservation of the Diversity of Canada Geese (*Branta canadensis*). Can. Wildl. Serv. Occas. Pap. No. 103.
- Dickson, K.M. 2000. The diversity of Canada Geese in K.M. Dickson (ed.), Towards Conservation of the Diversity of Canada Geese (*Branta canadensis*). Can. Wildl. Serv. Occas. Pap. No. 103.
- Dickson, D.L. 2012a. Seasonal movement of King Eiders breeding in western arctic Canada and northern Alaska. Can. Wildl. Serv. Tech. Report 520. Edmonton, AB.
- Dickson, D.L. 2012b. Movement of King Eiders from breeding grounds on Banks Island, NWT, to moulting and wintering areas. Can. Wildl. Serv. Tech. Report 516. Edmonton, AB.
- Didiuk, A. B., R. T. Alisauskas, and R. F. Rockwell. 2001. Interaction with arctic and subarctic habitats. Pages 19–32 in T. Moser, editor. The status of Ross's geese. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C., USA, and Canadian Wildlife Service, Ottawa, Ontario, Canada.
- Dufour, K. W., R. T. Alisauskas, R. F. Rockwell, and E. T. Reed. 2012. Temporal variation in survival and productivity of mid-continent lesser snow geese and survival of Ross's geese and its

- relation to population reduction efforts. Pages 95-131 in Leafloor, J. O., T. J. Moser, and B. D. J. Batt (eds.). Evaluation of special management measures for mid-continent lesser snow geese and Ross's geese. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C. and Canadian Wildlife Service, Ottawa, Ontario.
- Elliot, R.D. 1991: The management of the Newfoundland turr hunt. In Gaston, A.J. and R.D. Elliot (eds.): Studies of high latitude seabirds. 2. Conservation biology of the Thick billed Murre in the Northwest Atlantic. Canadian Wildlife Service Occasional Paper 69: 29-35.
- Elliot, R.D., B.T. Collins, E.G. Hayakawa and L. Metras. 1991: The harvest of murre in Newfoundland from 1977 78 to 1987 88. In Gaston, A.J. and R.D. Elliot (eds.): Studies of high latitude seabirds. 2. Conservation biology of the Thick billed Murre in the Northwest Atlantic. Canadian Wildlife Service Occasional Paper 69: 36-44.
- Environment Canada. 2013. Management Plan for the Barrow's Goldeneye (*Bucephala islandica*), Eastern Population, in Canada. *Species at Risk Act* Management Plan Series. Environment Canada, Ottawa. iv + 16 pages.
- Fabijan, M., R. Brook, D. Kuptana and J.E. Hines. 1997. The subsistence harvest of King and Common eiders in the Inuvialuit Settlement Region, 1988-1994, pp. 67-73 in D.L. Dickson (ed.), King and Common Eiders of the Western Canadian Arctic. Can. Wildl. Serv. Occas. Pap. No. 93.
- Fox, A.D., C. Glahder, C.R. Mitchell, D.A. Stroud, H. Boyd and J. Frikke. 1996. North American Canada Geese (*Branta canadensis*) in West Greenland. Auk 113: 231-233.
- Fronczak, D. 2013. Waterfowl Harvest and Population Survey Data. Estimates of U.S. Harvest, Hunting Activity, and Success Derived from the State-Federal Cooperative Harvest Information Program. U.S. Fish and Wildlife Service. Division of Migratory Bird Management, Bloomington, MN, 99 pp.
- Gaston, A.J. 2002a. Have changes in hunting regulations affected populations of Thick-billed Murres in the Eastern Canadian Arctic. Canadian Wildlife Service Occasional Paper 106: 5-12.
- Gaston, A.J. 2002b. Results of monitoring Thick-billed Murre populations in the Eastern Canadian Arctic, 1976-2000. Canadian Wildlife Service Occasional Paper 106: 13-50.
- Gaston, A.J. and G.J. Robertson. 2010. Trends in the harvest of Brünnich's Guillemots in Newfoundland: Effects of regulatory changes and winter sea-ice conditions. Wildlife Biology 16: 47-55.
- Gaston, A. J., P.A. Smith, L. McFarlane Tranquilla, W.A. Montevicchi, D.A. Fifield, H.G. Gilchrist, A. Hedd, M.L. Mallory, G.J. Robertson and R.A. Phillips. 2011. Movements and wintering areas of breeding age Thick-billed Murre *Uria lomvia* from two colonies in Nunavut, Canada. Marine Biology 158: 1929-1941.
- Gauthier, G. and E.T. Reed. 2007. Section II: Projected growth rate of the Greater Snow Goose population under alternative harvest scenarios, pp. 65-74 in Reed, E.T. and A.M. Calvert (eds.), Evaluation of the Special Conservation Measures for Greater Snow Geese: Report of the Greater Snow Goose Working Group. Arctic Goose Joint Venture Special Publication. Canadian Wildlife Service, Sainte-Foy, Quebec.
- Gendron, M.H., and A.C. Smith. 2013. National Harvest Survey web site. Bird Populations Monitoring, National Wildlife Research Centre, Canadian Wildlife Service, Ottawa, Ontario.
- Gilliland, S., H.G. Gilchrist, R. Rockwell, G.J. Robertson, J.P.L. Savard, F. Merkel and A. Mosbech. 2009. Evaluating the sustainability of harvest among Northern Common Eiders in Greenland and Canada. Wildlife Biology 15(1): 24-36.
- Gilliland, S.G. and G.J. Robertson. 2009. Composition of Eiders Harvested in Newfoundland. Northeastern Naturalist 16:4, pp. 501-518.
- Gilliland, S.G., L. Dickson, H.G. Gilchrist, C. Lepage and D. Bordage. 2011. Common and King Eider Monitoring Strategy in Canada. Report prepared by Environment Canada's Avian Monitoring Review Committee. 66 pp.
- Goudie, R.I. 1991. The Status of the Harlequin Duck (*Histrionicus histrionicus*) in Eastern North America. Committee on the Status of Endangered Wildlife In Canada (COSEWIC). Ottawa.
- Gratto-Trevor, C.L., V.H. Johnston and S.T. Pepper. 1998. Changes in shorebird and eider abundance in the Rasmussen Lowlands, N.W.T. Wilson Bull. 110: 316-325.
- Groves, D.J. 2012. The 2010 North American trumpeter swan survey. A Cooperative North American Survey, U.S. Fish and Wildlife Service, Division of Migratory Bird Management, Juneau, AK. 24 pp.
- Hagey, S., R.W. Brook and K.F. Abraham. 2013. Canada Goose Banding on the Coasts of James Bay and Hudson Bay, Ontario, and Akimiski Island, Nunavut Territory in 2013. Ontario Ministry of Natural Resources, Peterborough, Ontario.

- Hagmeier, K. 2002. Winter and spring migration ecology of black brant (*Branta bernicla nigricans*) in the Strait of Georgia, British Columbia. MSc thesis, Simon Fraser University, Burnaby, Canada.
- Hagmeier, K., B. Smith and W.S. Boyd. 2008. Estimating numbers of black brant using sequential spring staging sites. *Journal of Wildlife Management* 72: 1342-1351.
- Hansen, F. 2002. A farewell to Greenland's wildlife. - Gads Forlag, Denmark, 154 pp.
- Harvey, W.F. and J. Rodrigue. 2011. A Breeding Pair Survey of Atlantic Population Canada Geese in Northern Québec - 2011. Unpublished report of the Maryland Department of Natural Resources and the Canadian Wildlife Service, Quebec Region.
- Harvey, W.F. and J. Rodrigue. 2012. A Breeding Pair Survey of Atlantic Population Canada Geese in Northern Québec - 2012. Unpublished report of the Maryland Department of Natural Resources and the Canadian Wildlife Service, Quebec Region.
- Hedd, A., W.A. Montevecchi, L. McFarlane Tranquilla, C.M. Burke, D.A. Fifield, G.J. Robertson, R.A. Philips, C. Gjerdrum and P.M. Regular. 2011. Reducing uncertainty on the Grand Bank: Tracking and vessel surveys indicate mortality risks for common murre in the Northwest Atlantic. *Animal Conservation*. doi:10.1111/j.1469-1795.2011.00479.x
- Hines, J.E. and M.O. Wiebe Robertson (eds.). 2006. Surveys of Geese and Swans in the Inuvialuit Settlement Region, Western Canadian Arctic, 1989-2001. *Can. Wildl. Serv. Occas. Pap.* 112. Ottawa, Ontario.
- Hines, J.E., P.B. Latour, and C.S. Machtans. 2010. The effects on lowland habitat, breeding shorebirds and songbirds in the Banks Island Migratory Bird Sancturay Number 1 by the growing colony of Lesser Snow Geese (*Chen caerulescens caerulescens*). *Canadian Wildlife Service Occasional Paper* No. 118. Environment Canada, Ottawa.
- Hoover, A.K. and D.L. Dickson. 2007. Nesting ecology and survival of the Pacific Common Eider in Central Arctic Canada. *Canadian Wildlife Service Technical Report Series* No. 471, Edmonton.
- Irons, D.B., T. Anker-Nielsen, A.J. Gaston, G.V. Byrd, K. Falk, G. Gilchrist, M. Hario, M. Hjernquist, Y.V. Krasnov, A. Mosbech, B. Olsen, A. Petersen, J.B. Reid, G.J. Robertson, H. Strøm and K.D. Wohl. 2008. Fluctuations in circumpolar seabird populations linked to climate oscillations. *Global Change Biology* 14: 1455-1463.
- Johnston, V.H., C.L. Gratto-Trevor and S.T. Pepper. 2000. Assessment of Bird Populations in the Rasmussen Lowlands, Nunavut. *Can. Wildl. Serv. Occas. Pap.* No. 101.
- Joint Working Group on the Management of the Common Eider. 2004. Quebec Management Plan for the Common Eider *Somateria mollissima dresseri*. Spec. Publ. of the Joint Working Group on the Management of the Common Eider, Quebec.
- Kelley, J., S. Williamson and T.R. Cooper (eds). 2008. American Woodcock Conservation Plan. Woodcock Task Force, Migratory Shore and Upland Game Bird Working Group, Assoc. Fish Wildl. Agencies. Wildl. Manage. Inst.
- Kerbes, R.H. 1975. The Nesting Population of Lesser Snow Geese in the Eastern Canadian Arctic: A photographic inventory of June 1973. *Can. Wildl. Serv. Rep. Ser.* No. 35. 47 pp.
- Kerbes, R.H. 1994. Colonies and numbers of Ross's Geese and Lesser Snow Geese in the Queen Maud Gulf Migratory Bird Sanctuary. *Can. Wildl. Serv. Occas. Pap.* No. 81.
- Kerbes, R.H. 1996. Lesser Snow Geese: Too successful for their own good? *Bird Trends* 5: 17-19. Canadian Wildlife Service, Ottawa.
- Kerbes, R.H., V.V. Baranyuk and J.E. Hines. 1999a. Estimated size of the western Canadian Arctic and Wrangel Island Lesser Snow Goose populations on their breeding and wintering grounds, pp. 25-38 in Kerbes, R.H., K.M. Meeres and J.E. Hines (eds.), *Distribution, Survival and Numbers of Lesser Snow Geese of the Western Canadian Arctic and Wrangel Island, Russia*. *Can. Wildl. Serv. Occas. Pap.* No. 98.
- Kerbes, R. H., Meeres, K.M. and J.E. Hines (editors). 1999b. *Distribution, survival, and numbers of Lesser Snow Geese of the Western Canadian Arctic and Wrangle Island, Russia*. Canadian Wildlife Service Occasional Paper No. 98. Environment Canada, Ottawa.
- Klimstra, J.D. and Padding, P. 2013. Atlantic Flyway Waterfowl Harvest and Population Survey Data. Division of Migratory Bird Management, U.S. Fish and Wildlife Service, Laurel, Maryland.
- Kruse, K.L. 2007. Central Flyway. Harvest and Population Survey Data Book. 2007. USFWS. Division of Migratory Bird Management, Denver, Colorado, U.S.
- Kruse, K.L., J.A. Dubovsky and T.R. Cooper. 2013. Status and Harvests of Sandhill Cranes: Mid-Continent, Rocky Mountain and Lower Colorado River Valley Populations. Administrative Report, U.S. Fish and Wildlife Service, Denver, Colorado. 14 pp.

- Leafloor, J. O., T. J. Moser, and B. D. J. Batt, editors. 2012. Evaluation of special management measures for Mid-continent Lesser Snow Geese and Ross's Geese. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C. and Canadian Wildlife Service, Ottawa, Ontario.
- Lefebvre, J. 2013. Estimation de la population printanière de la Grande Oie des neiges dans le sud du Québec en 2013. Canadian Wildlife Service, Environment Canada, July 2013. 4pp.
- Lepage, C. and D. Bordage (Editors). 2013. Status of Quebec Waterfowl Populations, 2009. Technical Report Series No. 525, Canadian Wildlife Service, Environment Canada, Quebec Region, Quebec City. xiii + 243 pages.
- Lincoln, F. C. 1930. Calculating waterfowl abundance on the basis of banding returns. Circular 118, U.S. Department of Agriculture, Washington, D.C.
- Mallory, M.L., A.J. Fontaine and H. Boyd. 2005. Breeding and non-breeding range of Canada, *Branta canadensis*, and Cackling Geese, *Branta hutchinsii*, in the eastern Canadian Arctic. Can. Field Nat. 119(4): 483-489.
- Melnychuk, R., and J. P. Ryder. 1980. The distribution, fall migration routes and survival of Ross's geese. Wildfowl 31:161-171.
- Merkel, F.R. 2010. Evidence of Recent Population Recovery in Common Eiders Breeding in Western Greenland. The Journal of Wildlife Management, 74: 1869-1874.
- Mittelhauser, G.H. 2008. Harlequin Ducks in the Eastern United States. Waterbirds 31 (Special Publication 2): 58-66.
- Moser, T. J. 2001. The status of Ross's geese. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C., USA, and Canadian Wildlife Service, Ottawa, Ontario, Canada.
- Moser, T.J. (compiler). 2006. The 2005 North American Trumpeter Swan Survey. U.S. Fish and Wildlife Service, Denver, Colorado.
- Moser, T. J., and D. C. Duncan. 2001. Harvest of Ross's geese. Pages 43-54 in T. J. Moser, editor. The status of Ross's geese. Arctic Goose Joint Venture Special Publication. U.S. Fish and Wildlife Service, Washington, D.C., USA, and Canadian Wildlife Service, Ottawa, Ontario, Canada.
- Mowbray, T.B., C.R. Ely, J.S. Sedinger and R.E. Trost. 2002. Canada Goose (*Branta canadensis*), No. 682 in The Birds of North America (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.
- North American Waterfowl Management Plan, Plan Committee. 2012. North American Waterfowl Management Plan 2012: People Conserving Waterfowl and Wetlands. Canadian Wildlife Service, U.S. Fish and Wildlife Service, Secretaria de Medio Ambiente y Recursos Naturales. 48 pp.
- Nieman, D.J., K. Warner, J. Smith, J. Solberg, F. Roetker, N. Lyman and D. Lobpries. 2001. Fall Inventory of Mid-continent White-fronted Geese. Unpublished report of the Canadian Wildlife Service.
- Olson, S.M. and R.E. Trost. 2013. Pacific Flyway Data Book. Waterfowl Harvests and Status, Hunter Participation and Success in the Pacific Flyway and the United States. U.S. Fish and Wildlife Service, Division of Migratory Bird Management. Portland (Oregon). 106 pp.
- Petrie, S.A. and K.L. Wilcox. 2003. Migration chronology of Eastern-Population Tundra Swans. Can. J. Zool. 81: 861-870.
- Raftovich, R.V., and K.A. Wilkins. 2013. Migratory bird hunting activity and harvest during the 2011-12 and 2012-13 hunting seasons. U.S. Fish and Wildlife Service, Laurel, Maryland, USA.
- Rail, J.-F. and J.-P.L. Savard. 2003. Identification des aires de mue et de repos au printemps des macreuses (*Melanitta sp.*) et de l'Eider à duvet (*Somateria mollissima*) dans l'estuaire et le golfe du Saint-Laurent. Environment Canada, Technical Report Series No. 408, Canadian Wildlife Service, Quebec Region, Sainte-Foy, Quebec.
- Rail, J.-F. and R.C. Cotter. 2007. Sixteenth Census of Seabird Populations in the Sanctuaries of the North Shore of the Gulf of St. Lawrence, 2005. Canadian Field-Naturalist 121(3): 287-294.
- Raven, G.H. and D.L. Dickson. 2006. Changes in distribution and abundance of birds on western Victoria Island from 1992-1994 to 2004-2005. Canadian Wildlife Service, Technical Report Series No. 456, Edmonton, 60 pp.
- Raven, G.H. and D.L. Dickson. 2008. Surveys of Common Eiders in the Bathurst Inlet area of Nunavut. Annual Report to Sea Duck Joint Venture.
- Reed, A., J.-F. Giroux and G. Gauthier. 1998a. Population size, productivity, harvest and distribution, pp. 5-31 in B.D.J. Batt (ed.), The Greater Snow Goose: Report of the Arctic Goose Habitat Working Group. Arctic Goose Joint Venture Special Publication, U.S. Fish and Wildlife Service, Washington, D.C., and Canadian Wildlife Service, Ottawa, Ontario.
- Reed, A., D.H. Ward, D.V. Derksen and J.S. Sedinger. 1998b. Brant (*Branta bernicla*), No. 337 in The Birds of North America (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.
- Reed, E. T., and A.M. Calvert (editors). 2007. Evaluation of special conservation measures for

- Greater Snow Geese: Report of the Greater Snow Goose Working Group. Arctic Goose Joint Venture Special Publication. Canadian Wildlife Service, Sainte-Foy, Quebec.
- Regular, P.M., G.J. Robertson, W.A. Montevecchi, F. Shuhood, T. Power, D. Ballam and J. F. Piatt. 2010. Relative importance of human activities and climate driving common murre population trends in the Northwest Atlantic. *Polar Biology* 33: 1215-1226.
- Robert, M. 2013. Barrow's Goldeneye, pp. 190-194 in Lepage, C. and D. Bordage, eds. Status of Quebec Waterfowl Populations, 2009. Technical Report Series No. 525, Canadian Wildlife Service, Environment Canada, Quebec Region, Quebec City. xiii + 243 pages.
- Robert, M., J.-P.L. Savard, G. Fitzgerald and P. Laporte. 1999. Satellite tracking of Barrow's Goldeneyes in eastern North America: Location of breeding areas and moulting sites. Proceedings of the 15th International Symposium on Biotelemetry, May 9-14, Juneau, Alaska.
- Robert, M., D. Bordage, J.-P.L. Savard, G. Fitzgerald and F. Morneau. 2000. The breeding range of the Barrow's Goldeneye in eastern North America. *Wilson Bulletin* 112: 1-7.
- Robert, M., R. Benoit and J.-P.L. Savard. 2002. Relationship between breeding, moulting and wintering areas of male Barrow's Goldeneyes in eastern North America. *Auk* 119(3): 676-684.
- Robert, M. and J.-P.L. Savard. 2006. The St. Lawrence River Estuary and Gulf: A stronghold for Barrow's Goldeneyes wintering in eastern North America. *Waterbirds* 29(4): 437-450.
- Robert, M., B. Drolet and J.-P.L. Savard. 2008. Habitat features associated with Barrow's Goldeneye breeding in eastern Canada. *Wilson Journal of Ornithology* 120: 320-330.
- Robertson, G.J. and H.G. Gilchrist. 1998. Evidence of population declines among common eiders breeding in the Belcher Islands, Northwest Territories. *Arctic* 51: 378-385.
- Robertson, G.J. and R.I. Goudie. 1999. Harlequin Duck (*Histrionicus histrionicus*), in The Birds of North America, No. 466 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.
- Robertson, G. J., S.I. Wilhelm, and P.A. Taylor. 2004. Population size and trends of seabirds breeding on Gull and Great Islands, Witless Bay Islands Ecological Reserve, Newfoundland, up to 2003. Canadian Wildlife Service Technical Report Series No. 418. Atlantic Region.
- Robertson, G.J., A.E. Storey and S.I. Wilhelm. 2006. Local survival rates of common murre breeding in Witless Bay, Newfoundland. *Journal of Wildlife Management* 70: 584-587.
- Rockwell, R., E. Cooch, and S. Brault. 1997. Pages 73-100, in Batt, B.D.J. (ed.), Arctic Ecosystems in Peril: Report of the Arctic Goose Habitat Working Group. Arctic Goose Joint Venture Special Publication, U.S. Fish and Wildlife Service, Washington, D.C., and Canadian Wildlife Service, Ottawa, Ontario. 120 pp.
- Ryder, J.P. and R.T. Alisauskas. 1995. Ross' Goose (*Chen rossii*), in The Birds of North America, No. 162 (A. Poole and F. Gill, eds.). The Academy of Natural Sciences, Philadelphia, and The American Ornithologists' Union, Washington, D.C.
- Samelius, G. and R.T. Alisauskas. 2009. Habitat alteration by geese at a large arctic goose colony: consequences for lemmings and voles. *Canadian Journal of Zoology* 87:95-101.
- Sanders, T.A. 2012. Band-tailed Pigeon Population Status, 2012. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.
- Savard, J.-P.L., D. Bordage and A. Reed. 1998. Surf Scoter (*Melanitta perspicillata*), in The Birds of North America, No. 363 (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.
- Savard, J.-P.L., S.G. Gilliland, R. Rockwell, G. Gauthier, J.-F. Giroux, B. Allan, and K. Mehl. 2004. International Workshop: Modeling American Eider Populations, Sainte Foy, Quebec.
- Savard, J.-P.L. 2008. Diversité, abondance et répartition des oiseaux aquatiques hivernant dans les eaux côtières du Parc marin Saguenay-Saint-Laurent. *Revue des sciences de l'eau* 21: 505-523.
- Savard, J.-P. and M. Robert. 2013. Relationships among Breeding, Molting and Wintering Areas of Adult Female Barrow's Goldeneyes (*Bucephala islandica*) in Eastern North America. *Waterbirds* 36(1): 34-42.
- Scribner, K.T., S. Libants, R. Inman, S. Talbot, B. Pierson and R. Lanctot. 2000. Genetic variation among eastern breeding populations of Harlequin Ducks (*Histrionicus histrionicus*). Unpublished report of the U.S. Fish and Wildlife Service.
- Scribner, K.T., R.A. Malecki, B.D.J. Batt, R.L. Inman, S. Libants and H.H. Prince. 2003. Identification of source population for Greenland Canada Geese: Genetic assessment of a recent colonization. *Condor* 105: 771-782.
- Sea Duck Joint Venture. 2007. Recommendations for Monitoring Distribution, Abundance, and Trends for North American Sea Ducks. December 2007. Available at <http://seaduckjv.org>
- Sea Duck Joint Venture. 2012. Atlantic and Great Lakes Sea Duck Migration Study. Progress Report November 2012. 65 pp. Available at

<http://seaduckiv.org>

- Seamans, M.E., K. Parkers and T.A. Sanders. 2013. Mourning dove population status, 2013. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Washington, D.C.
- Smith, A.C. and M. Gendron, 2013a, Spring Snow Goose Hunt in Quebec 2013. National Wildlife Research Centre. Canadian Wildlife Service. Environment Canada. 9 pp.
- Smith, A.C. and M. Gendron, 2013b, Spring Snow Goose Hunt in Ontario 2013. National Wildlife Research Centre. Canadian Wildlife Service. Environment Canada. 7 pp.
- Smith, A.C. and M. Gendron, 2013c, Spring Snow Goose Hunt in Saskatchewan 2013. National Wildlife Research Centre. Canadian Wildlife Service. Environment Canada. 5 pp.
- Snow Goose, Brant and Swan Committee of the Atlantic Flyway Council. 2013. Assessing the Conservation Order for Light Geese in the Atlantic Flyway in 2013. Unpublished Report of the Atlantic Flyway Council.
- Suydam, R.S. 2000. King Eider (*Somateria spectabilis*), No. 491 in The Birds of North America (A. Poole and F. Gill, eds.). The Birds of North America, Inc., Philadelphia, Pennsylvania.
- Suydam, R.S., D.L. Dickson, J.B. Fadely and L. T. Quakenbush. 2000. Population declines of King and Common eiders of the Beaufort Sea. Condor 102: 219-222.
- Suydam, R.S., Quakenbush, L.T., Acker, R. Knoche, M., Citta, J. 2008. Migration of king and common eiders past Point Barrow, Alaska, during summer/fall 2002 through spring 2004: population trends and effects of wind. Final report to University of Alaska Coastal Marine Institute, University of Alaska Fairbanks and USDOI, MMS, Alaska OCS Region.
- Thomas, P.W. and M. Robert. 2001. Updated COSEWIC Status Report of the Eastern North American Harlequin Duck (*Histrionicus histrionicus*). Report prepared for the Committee on the Status of Endangered Wildlife in Canada (COSEWIC), Ottawa, Ontario.
- U.S. Department of the Interior and Environment Canada. 1987. Standard Operating Procedures for Aerial Waterfowl Breeding Ground Population and Habitat Surveys in North America. Unpublished report of the U.S. Fish and Wildlife Service and Canadian Wildlife Service.
- USFWS. 2013. Waterfowl Population Status, 2013. U.S. Department of the Interior, Washington, D.C. USA.
- Wiebe Robertson, M.O. and J.E. Hines. 2006. Aerial surveys of Lesser Snow Goose colonies at Anderson River and Kendall Island, Northwest Territories, 1996-2001. Pp. 58-61 in J.E. Hines and M.O. Wiebe Robertson (eds.), Surveys of geese and swans in the Inuvialuit Settlement Region, Western Canadian Arctic, 1989-2001. Can. Wildl. Serv. Occas. Pap. No. 112. Ottawa, Ontario.
- Wiese, F.K., G.J. Robertson and A.J. Gaston. 2004. Impacts of chronic marine oil pollution and the murre hunt in Newfoundland on thick-billed murre *Uria lomvia* populations in the eastern Canadian Arctic. Biological Conservation 116: 205-216.
- Wildfowl and Wetlands Trust. 2013. (<http://monitoring.wwt.org.uk/wp-content/uploads/2013/09/GooseNews12.pdf>)
- Wildlife Habitat Canada. April 2012. News Letter-update on activities. 2 pp. <http://www.whc.org/en/about/publications/201-updates-on-activities>
- Wilhelm, S.I., G.J. Robertson, P.C. Ryan, S. Tobin and R.D. Elliot. 2009. Re-evaluating the use of beached bird oiling rates to assess long-term trends in chronic oil pollution. Marine Pollution Bulletin 58: 249-255.

Appendices

APPENDIX A – SPECIAL CONSERVATION MEASURES FOR FALL 2013 AND SPRING 2014

Measures in Quebec Concerning Overabundant Species

Area	Period during which Snow Geese may be killed	Additional hunting method or equipment
District A	September 1 to December 16, 2013, and May 1 to June 30, 2014	Recorded bird calls(d)(f) Recorded bird calls(d)
District B	September 15 to December 28, 2013	Recorded bird calls(d)(f)
District C and D	September 1 to September 13, 2013(a), September 14 to December 28, 2013, and March 1 to May 31, 2014(a)	Recorded bird calls(d)(f) Recorded bird calls(d)(f) Recorded bird calls(d)
District E	September 1 to September 13, 2013(a), September 15 to December 28, 2013, and March 1 to May 31, 2014(a)	Recorded bird calls(d)(f) and bait crop area(e) Recorded bird calls(d); bait(e)
District F	September 6 to September 20, 2013(a), September 21, 2013, to January 4, 2014 and March 1 to May 31, 2014(a)(b)(c)	Recorded bird calls(d)(f) and bait crop area(e) Recorded bird calls(d); bait(e)
District G	September 28 to December 26, 2013	Recorded bird calls(d)(f)

(a) Hunting and hunting equipment are allowed only on farmland.

(b) In District F, no person shall hunt south of the St. Lawrence River and north of the road right-of-way of Route 132 between the western limit of the municipality of Montmagny and the eastern limit of the municipality of Cap-Saint-Ignace, other than in lots 4 598 472 and 2 61 981 in Montmagny municipality.

(c) In District F, on the north shore of the St. Lawrence River, no person shall hunt north of the St. Lawrence River and south of a line located at 1000 m north of Highway 40 between Montée St-Laurent and the Maskinongé River. On the south shore of the St. Lawrence River, no person shall hunt south of the St. Lawrence River and north of the railroad right-of-way located near Route 132 between the Nicolet River in the east and Lacerte Road in the west.

(d) "Recorded bird calls" refers to bird calls of a species referred to in the heading of column 2.

(e) Hunting with bait or in a bait crop area is permitted if the Regional Director has given consent in writing pursuant to section 23.3.

(f) Any species of migratory bird for which it is open season may be taken while hunting Snow geese with recorded Snow Geese calls.

Measures in Ontario Concerning Overabundant Species

Area	Period during which Snow Geese may be killed	Additional hunting method or equipment
Wildlife Management Unit 65	March 1 to May 31, 2014(a)	Recorded bird calls(b)

(a) Hunting and hunting equipment are allowed only on farmland.

(b) "Recorded bird calls" refers to bird calls of a species referred to in the heading of column 2.

Measures in Manitoba Concerning Overabundant Species

Area	Period during which Snow Geese may be killed	Additional hunting method or equipment
Zone 1	August 15 to August 31, 2013, and April 1 to June 15, 2014	Recorded bird calls(a)
Zones 2, 3 and 4	March 15 to May 31, 2014	Recorded bird calls(a)

(a) "Recorded bird calls" refers to bird calls of a species referred to in the heading of column 2.

Measures in Saskatchewan Concerning Overabundant Species

Area	Period during which Snow Geese may be killed	Additional hunting method or equipment
East of 106°W longitude	April 1 to May 31, 2014	Recorded bird calls(a)
West of 106°W longitude	April 1 to April 30, 2014	Recorded bird calls(a)

(a) "Recorded bird calls" refers to bird calls of a species referred to in the heading of column 2.

Measures in Nunavut Concerning Overabundant Species

Item	Area	Period during which Snow Geese may be killed	Additional hunting method or equipment
1.	Throughout Nunavut	August 15 to August 31, 2013, and May 1 to June 30, 2014	Recorded bird calls(a)(b)

(a) "Recorded bird calls" refers to bird calls of a species referred to in the heading of column 2.

(b) Snow Goose call recordings may be used but, if used with decoys, the decoys may only represent white phase Snow Geese or blue phase Snow Geese, or any combination of them.

APPENDIX B – FIGURES

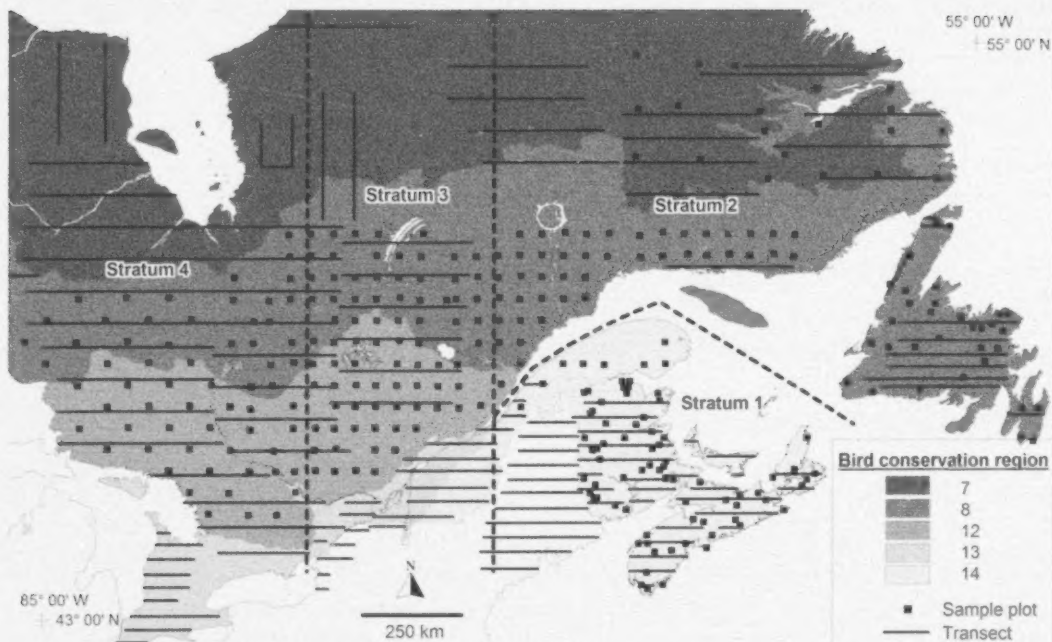


Figure 1. Eastern Waterfowl Survey Area in Eastern Canada
(Source: C. Lepage and M. Melançon, CWS, Quebec region)

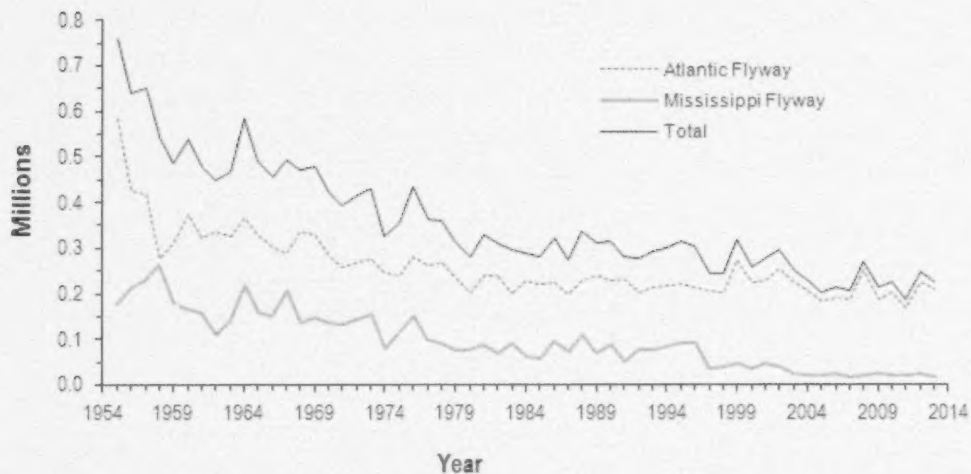


Figure 2. American Black Ducks in the Atlantic and Mississippi Flyways in mid-winter
Survey results in the Atlantic Flyway for 2001 and in the Mississippi Flyway for 1993 and 1998 were incomplete in some states.
(Source: Klimstra and Padding 2013)

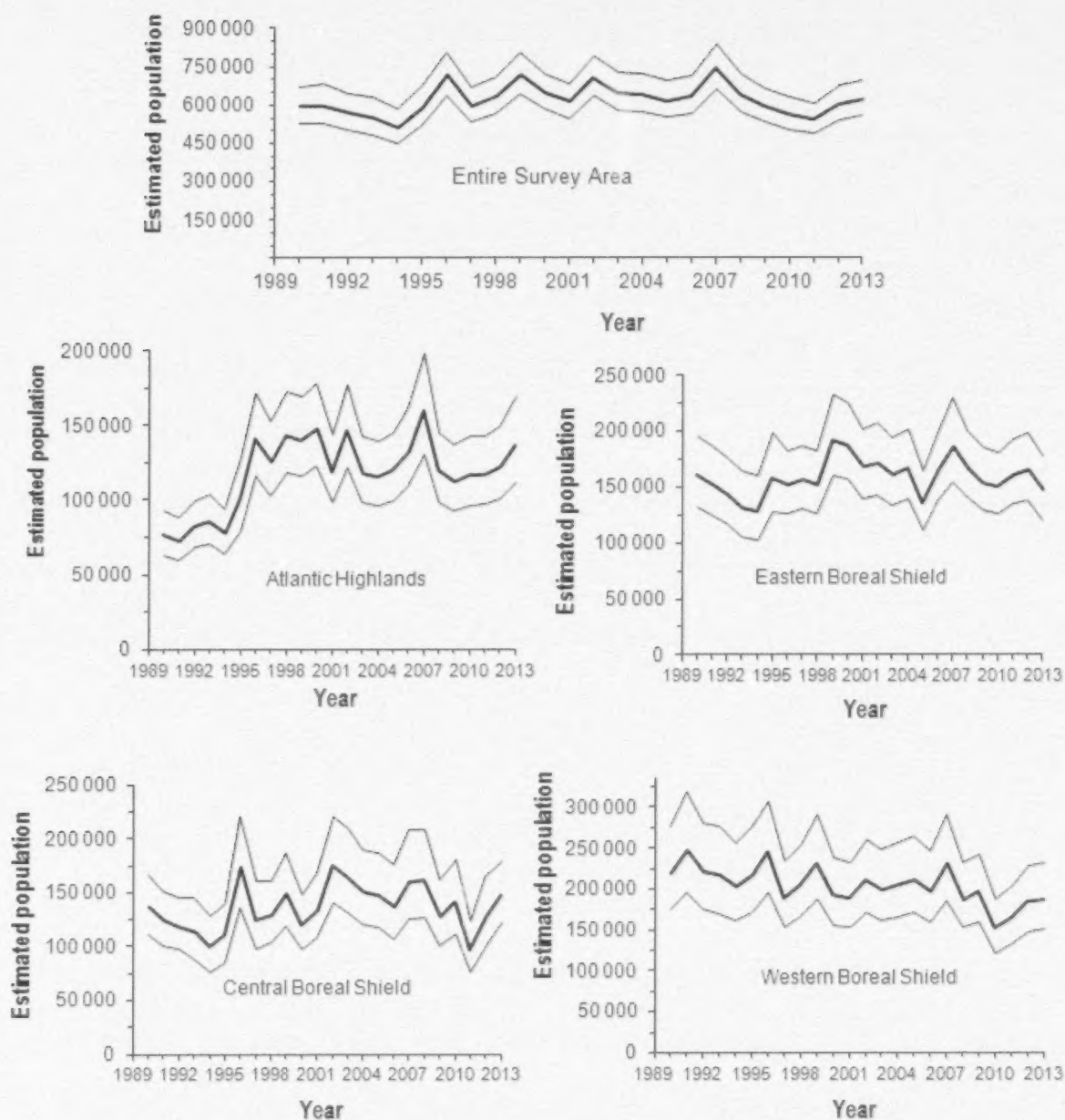


Figure 3. American Black Ducks in the Eastern Waterfowl Survey Area
Population Estimate and 90% credible intervals. The figures represent the combined results of helicopter and fixed-wing aircraft surveys.

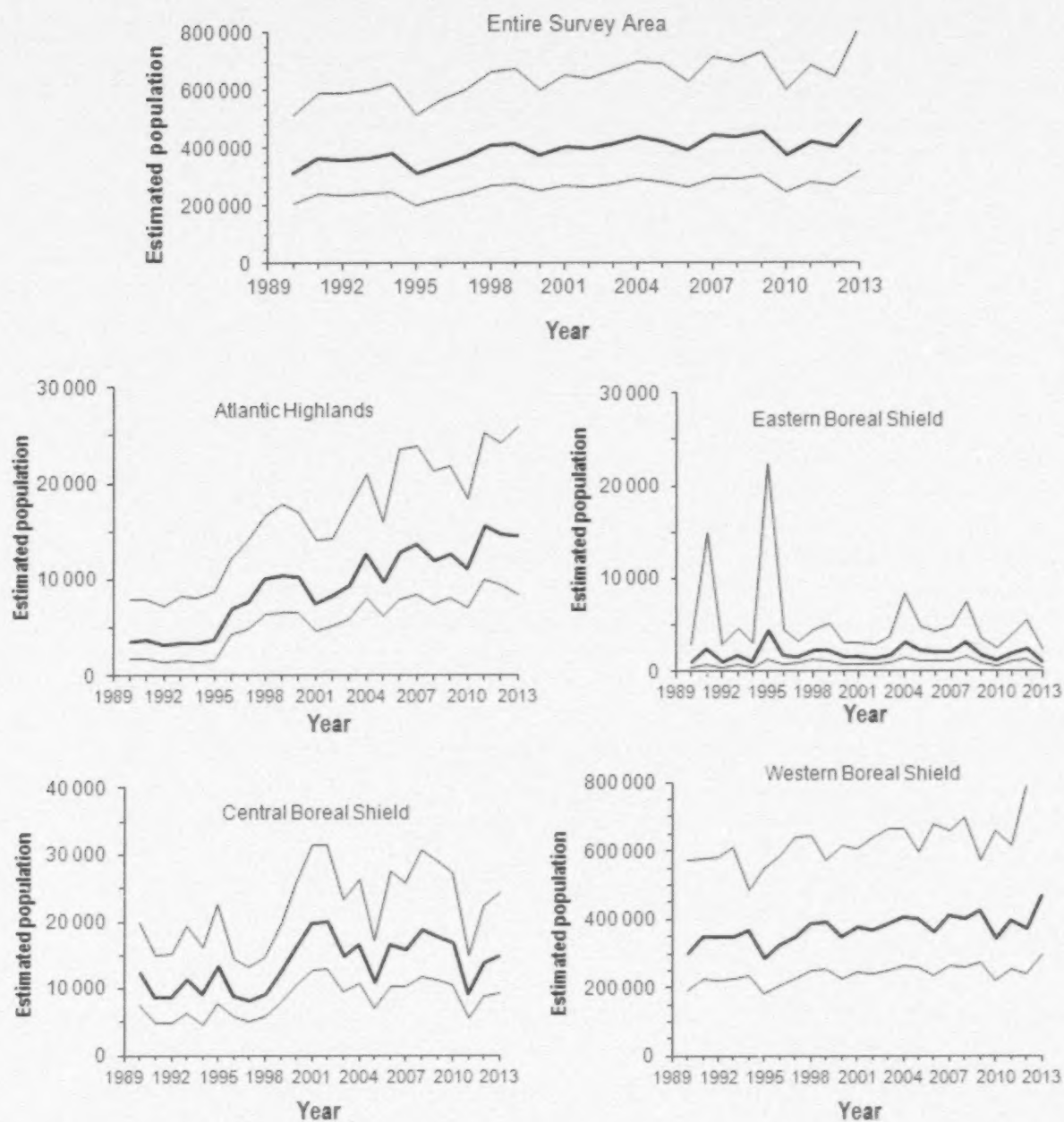


Figure 4a. Mallards in the Eastern Waterfowl Survey Area
Population Estimate and 90% credible intervals. The figures represent the combined results of helicopter and fixed-wing aircraft surveys.

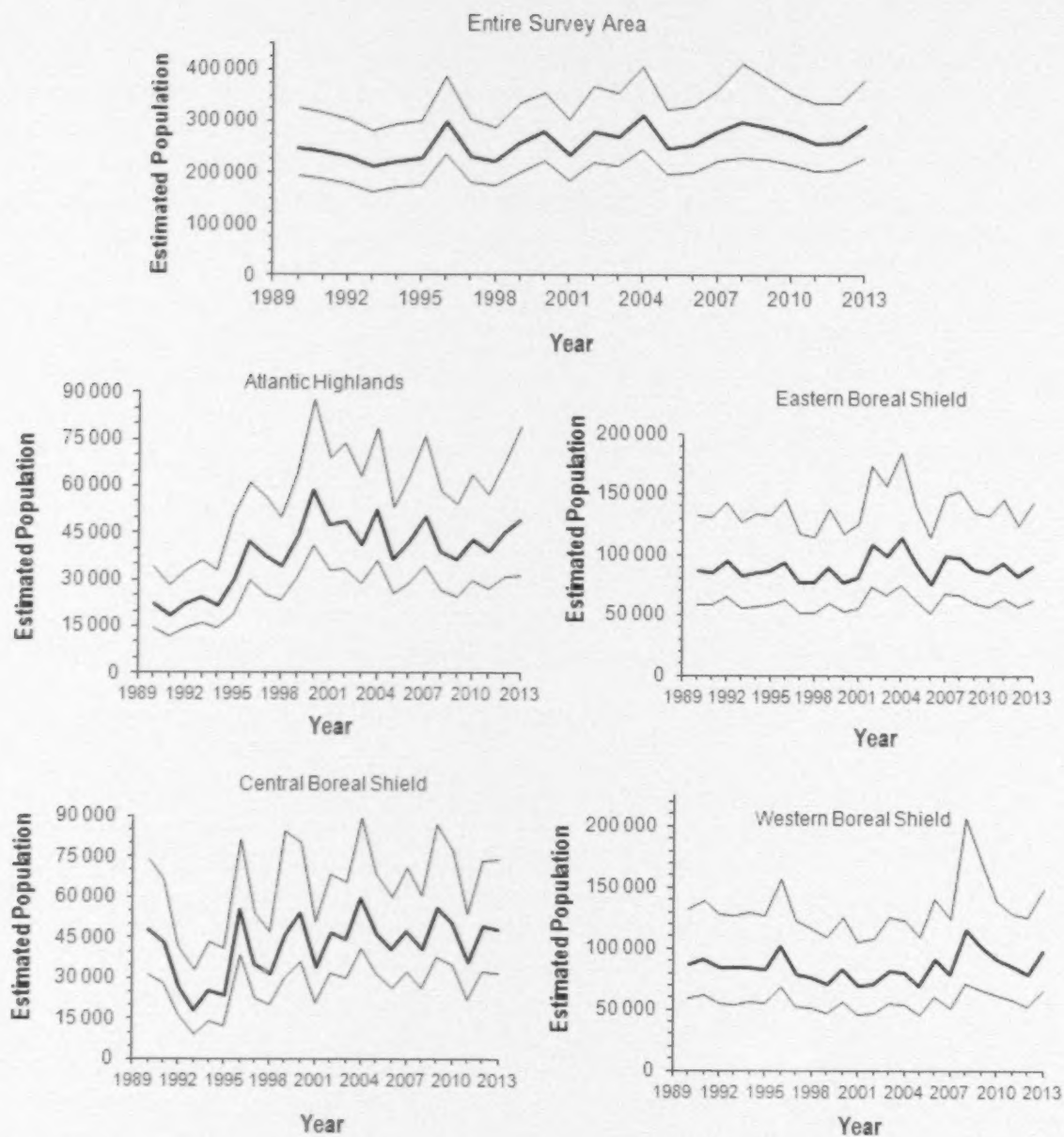


Figure 4b. American Green-winged Teal in the Eastern Waterfowl Survey Area
Population Estimate and 90% credible intervals. The figures represent the combined results of helicopter and fixed-wing aircraft surveys.

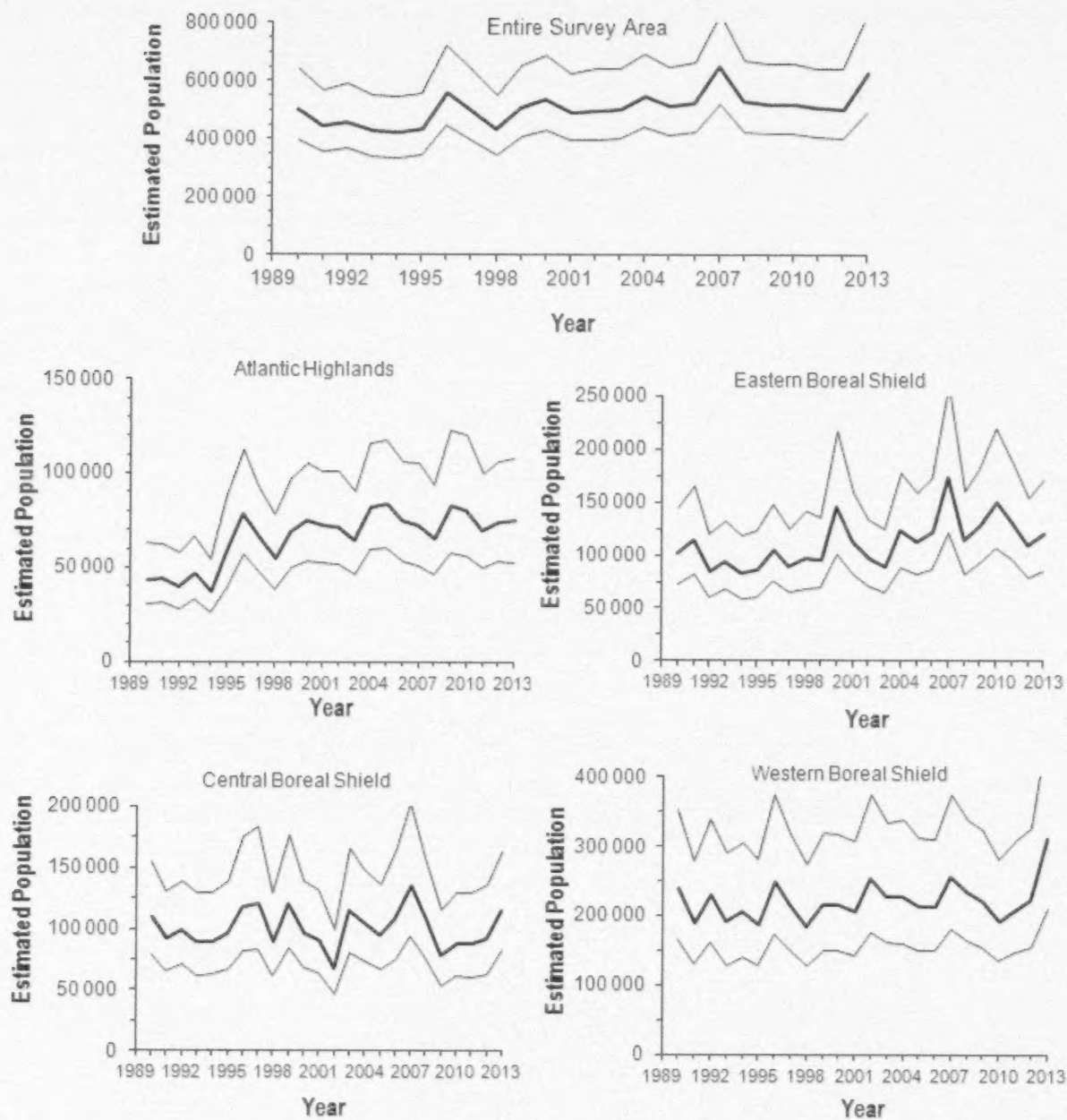


Figure 4c. Ring-necked Ducks in the Eastern Waterfowl Survey Area
Population Estimate and 90% credible intervals. The figures represent the combined results of helicopter and fixed-wing aircraft surveys.

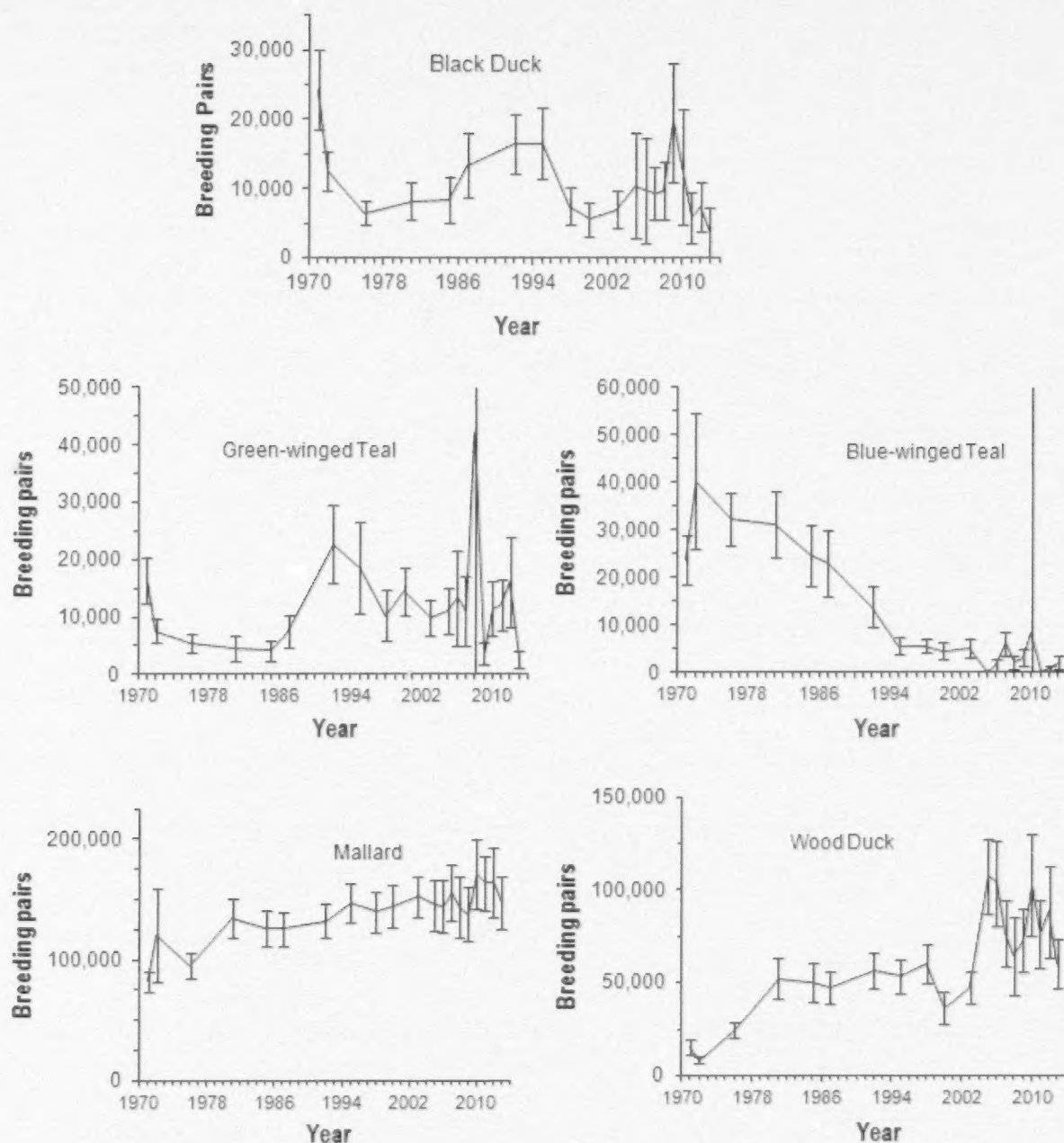


Figure 5a. Estimated Breeding Pairs (± 1 SE) of Dabbling Duck Species in Southern Ontario, based on Ground Survey Plots, 1971–2013
(Source: S. Meyer, CWS, Ontario Region)

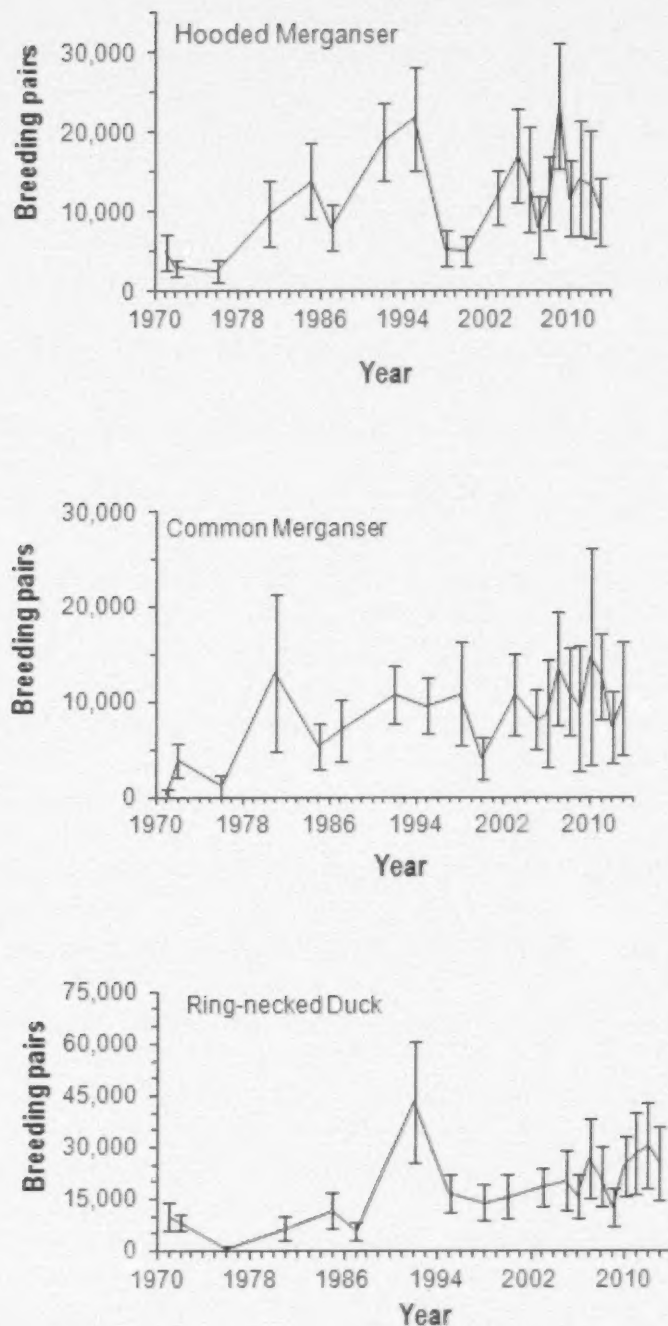


Figure 5b. Estimated Breeding Pairs (± 1 SE) of Diving Duck Species in Southern Ontario, based on Ground Plots, 1971–2013
(Source: S. Meyer, CWS, Ontario Region)



Regions of the WBPBS

1. Strata 1-11
2. Strata 12-25, 50, 75-77
3. Strata 26-40
4. Strata 41-49

Alaska
 Western Boreal Canada
 Canadian Prairies
 U.S. Prairies

Figure 6. Waterfowl Breeding Population and Habitat Survey of Western Canada:
Traditional Survey Area of Western Canada and the United States
 (Source: U.S. Department of the Interior and Environment Canada)

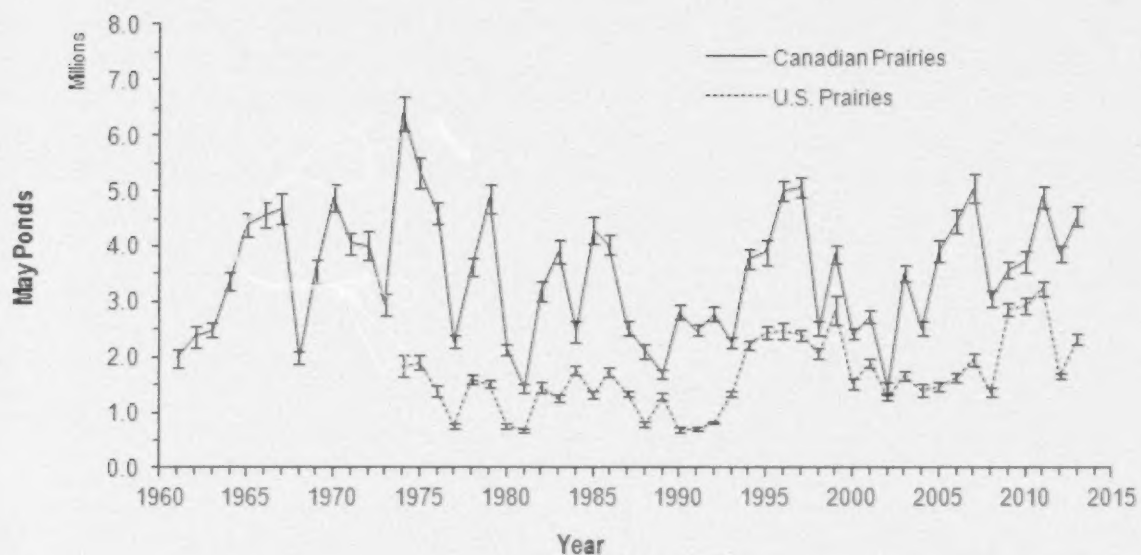


Figure 7. May Ponds in the Canadian and U.S. Prairies
(Estimated number of ponds \pm 1 SE)

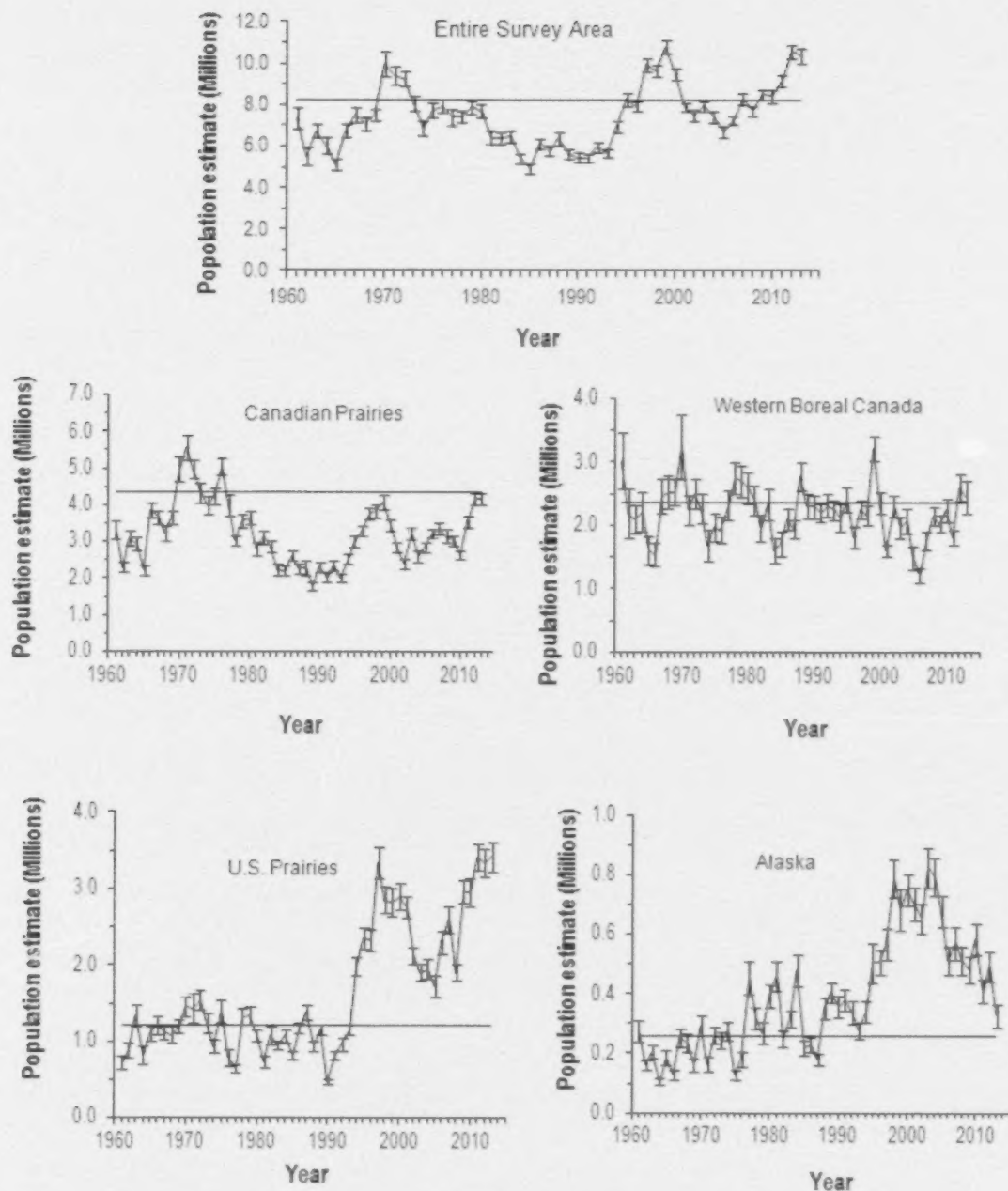


Figure 8. Mallard Breeding Population in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
Data shown are population estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

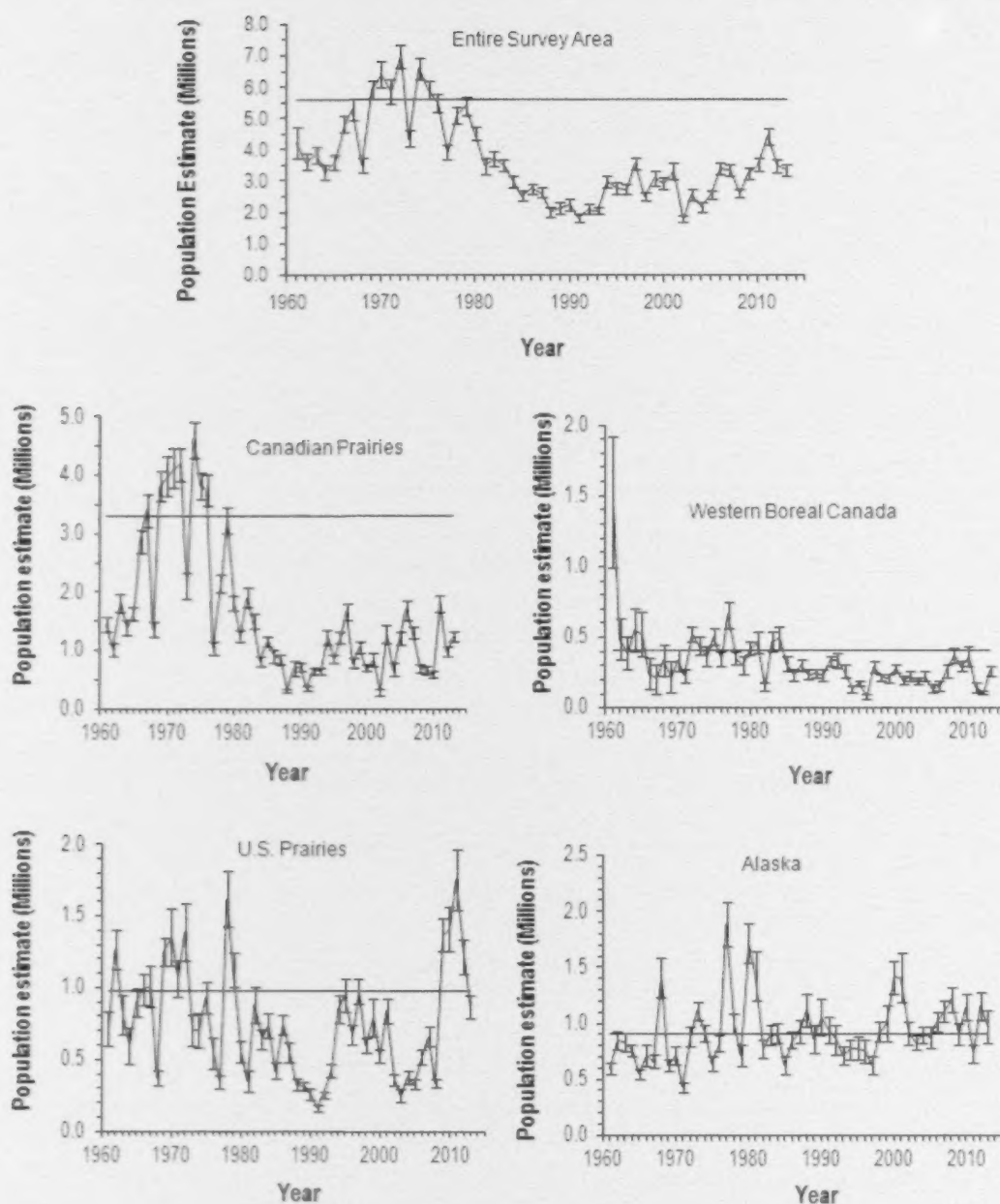


Figure 9. Northern Pintail Breeding Population in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey

Data shown are population estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

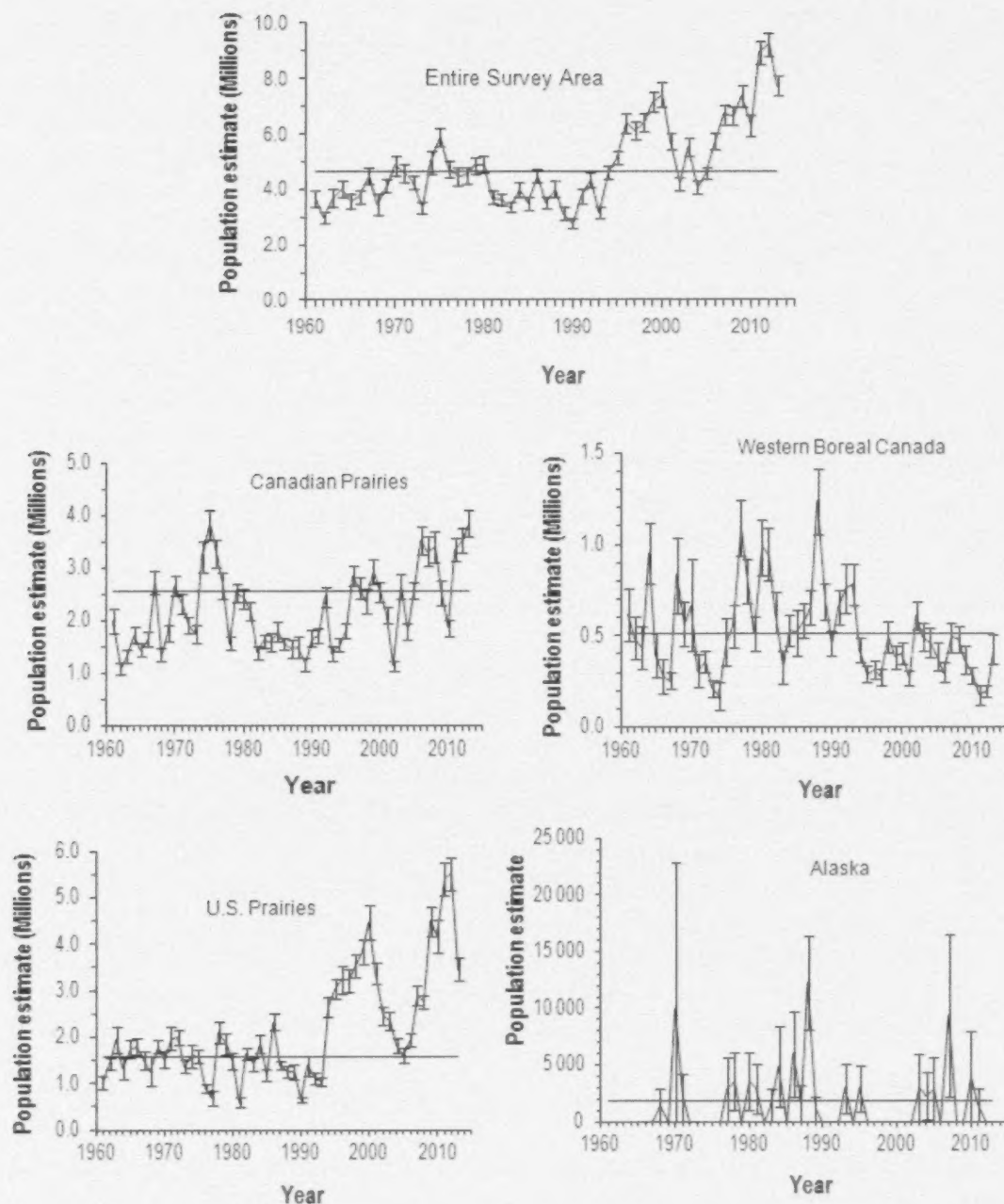


Figure 10. Blue-winged Teal Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
Data shown are population estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

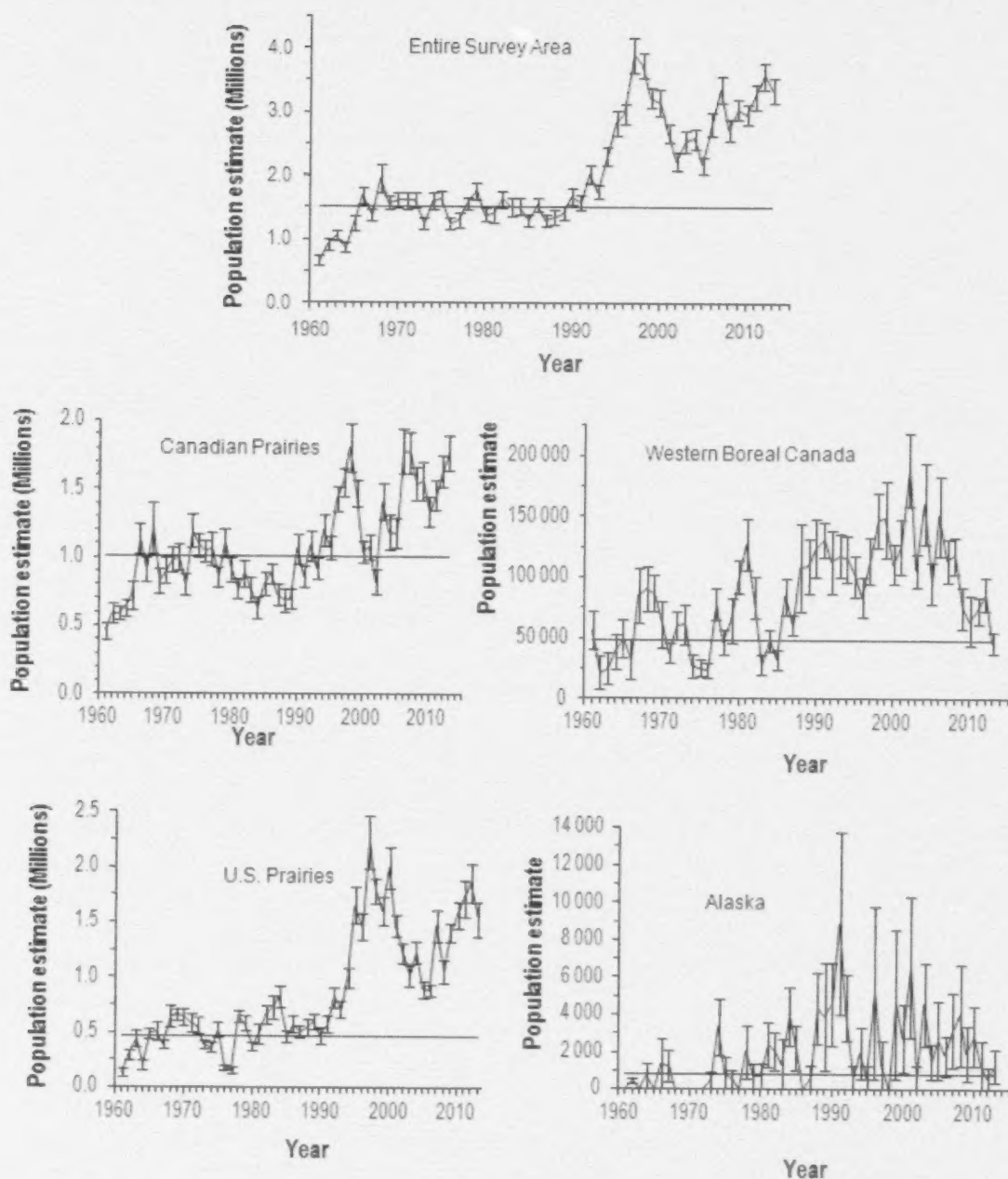


Figure 11. Gadwall Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
Data shown are estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

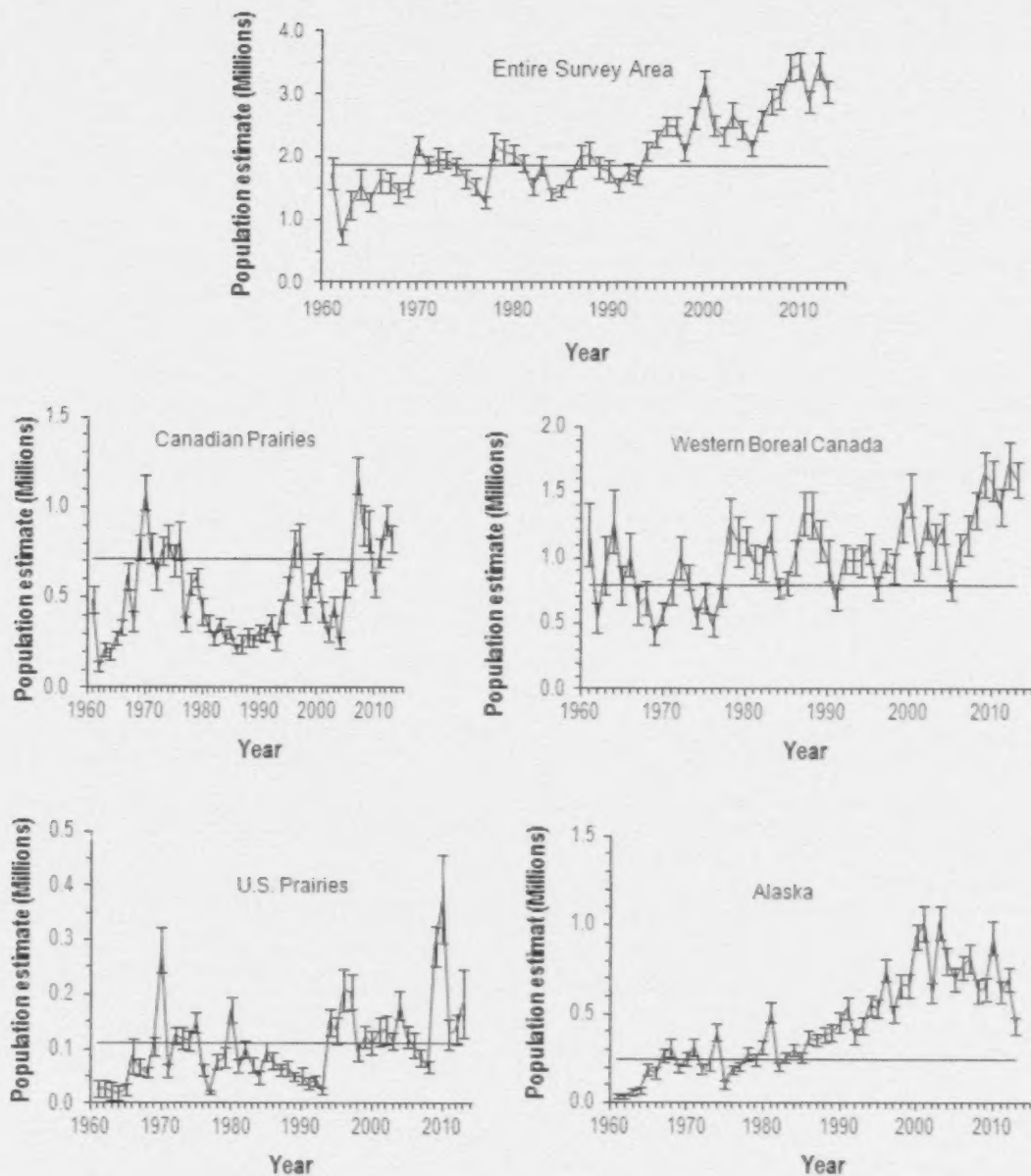


Figure 12. Green-winged Teal Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
Data shown are estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

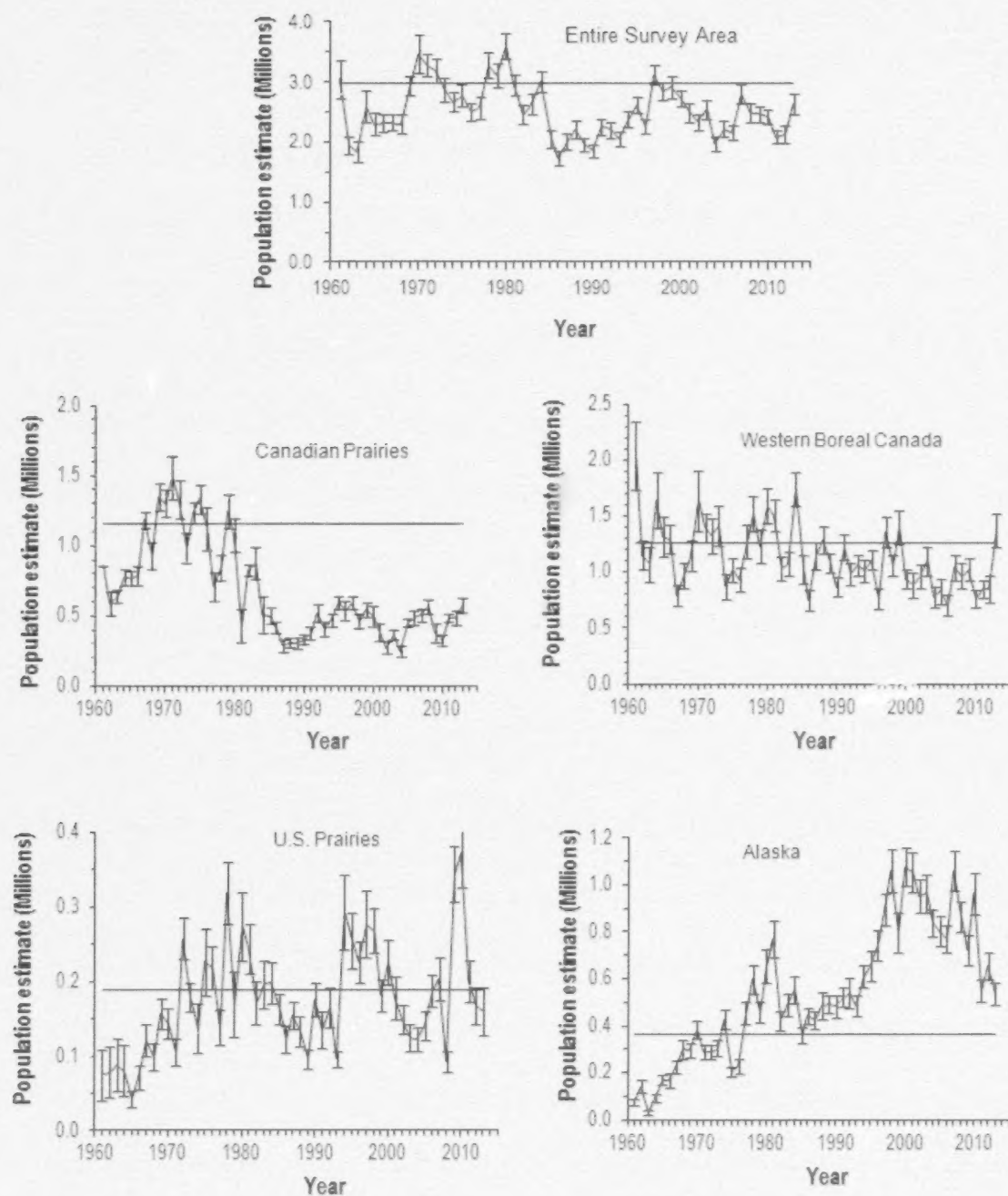


Figure 13. American Wigeon Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
Data shown are estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

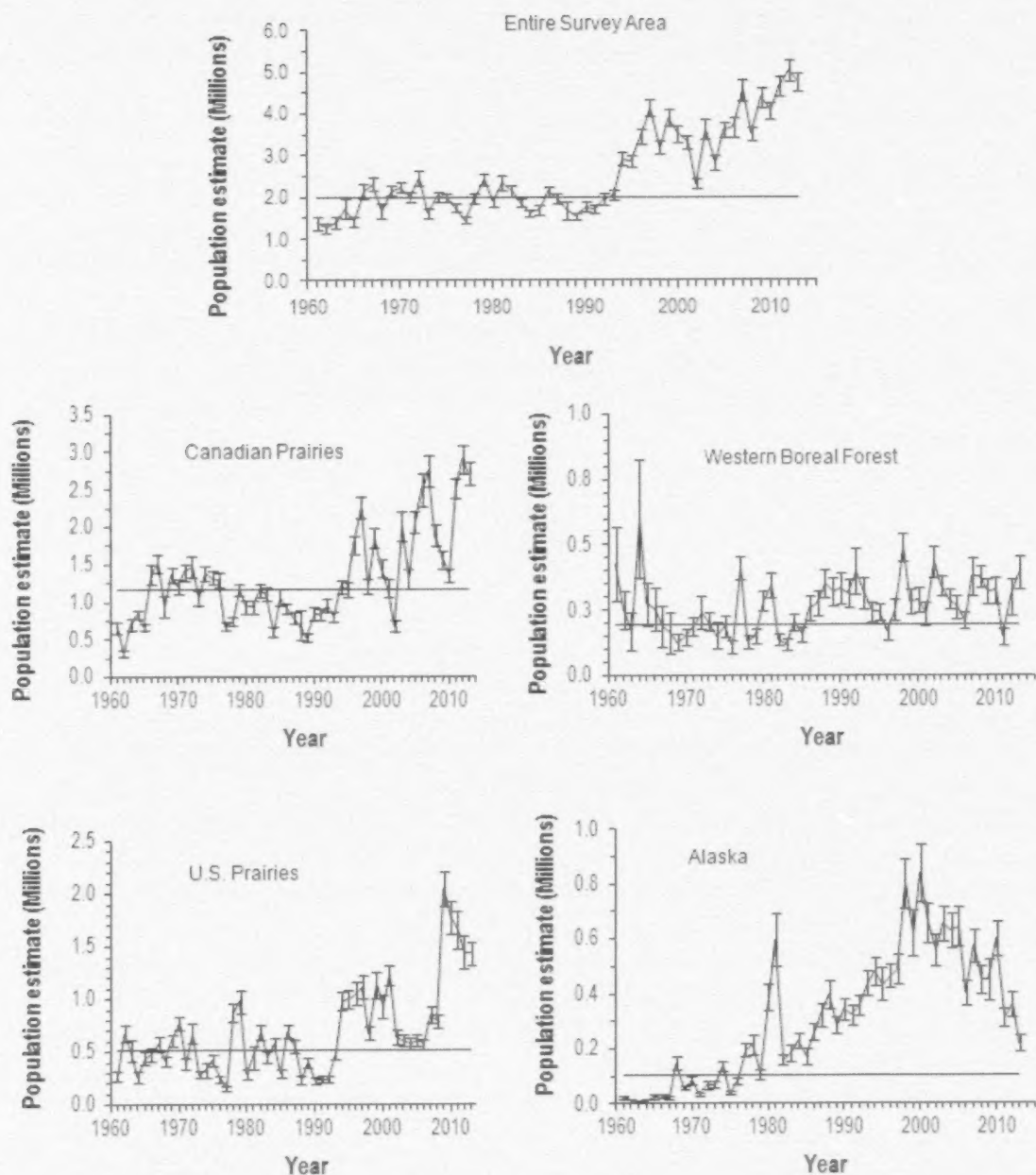


Figure 14. Northern Shoveler Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey

Data shown are estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

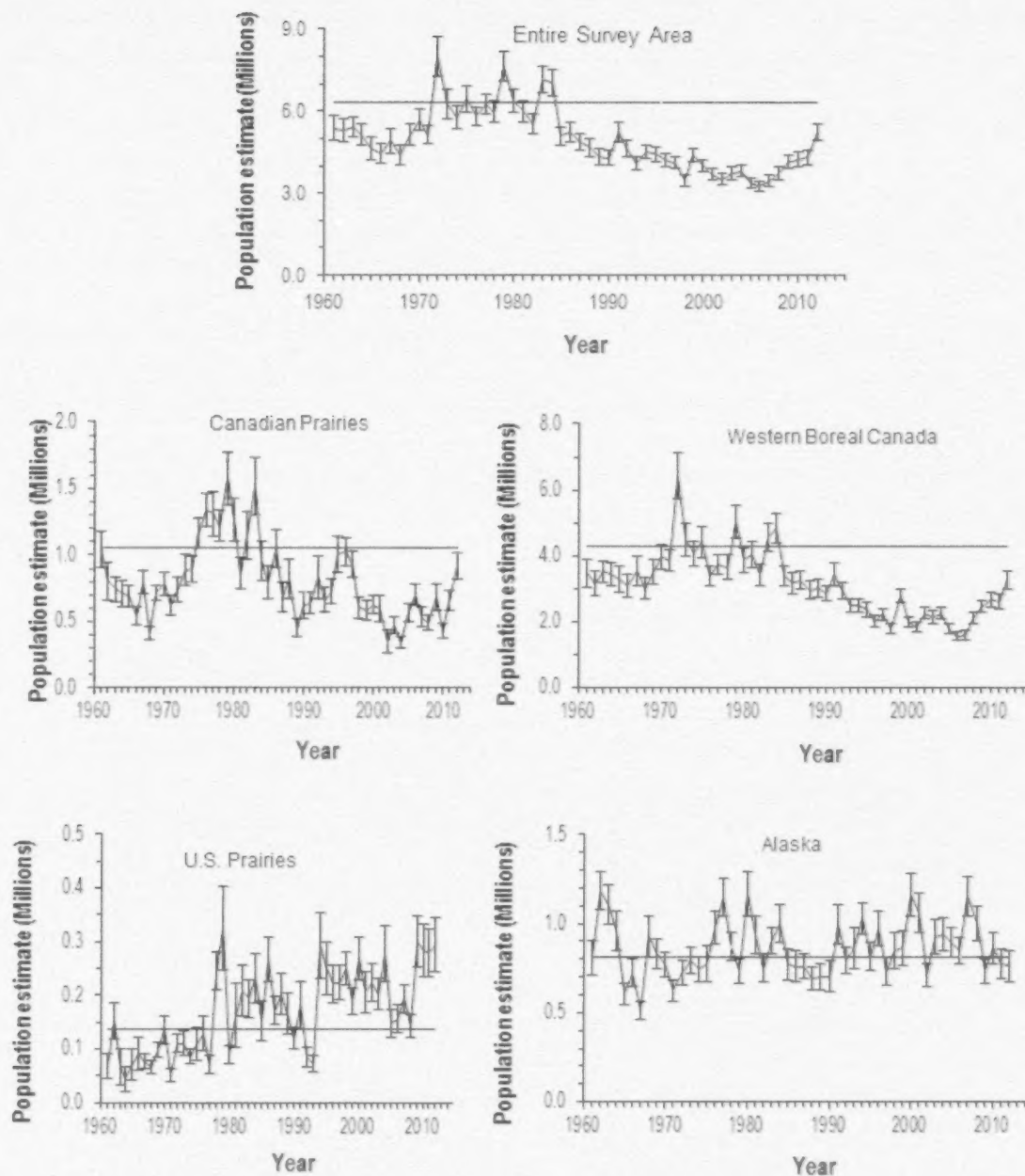


Figure 15. Scaup spp. Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
 Data shown are estimates (± 1 SE). The horizontal line represents the NAWMP population goal.
 (No data were available in 2013).

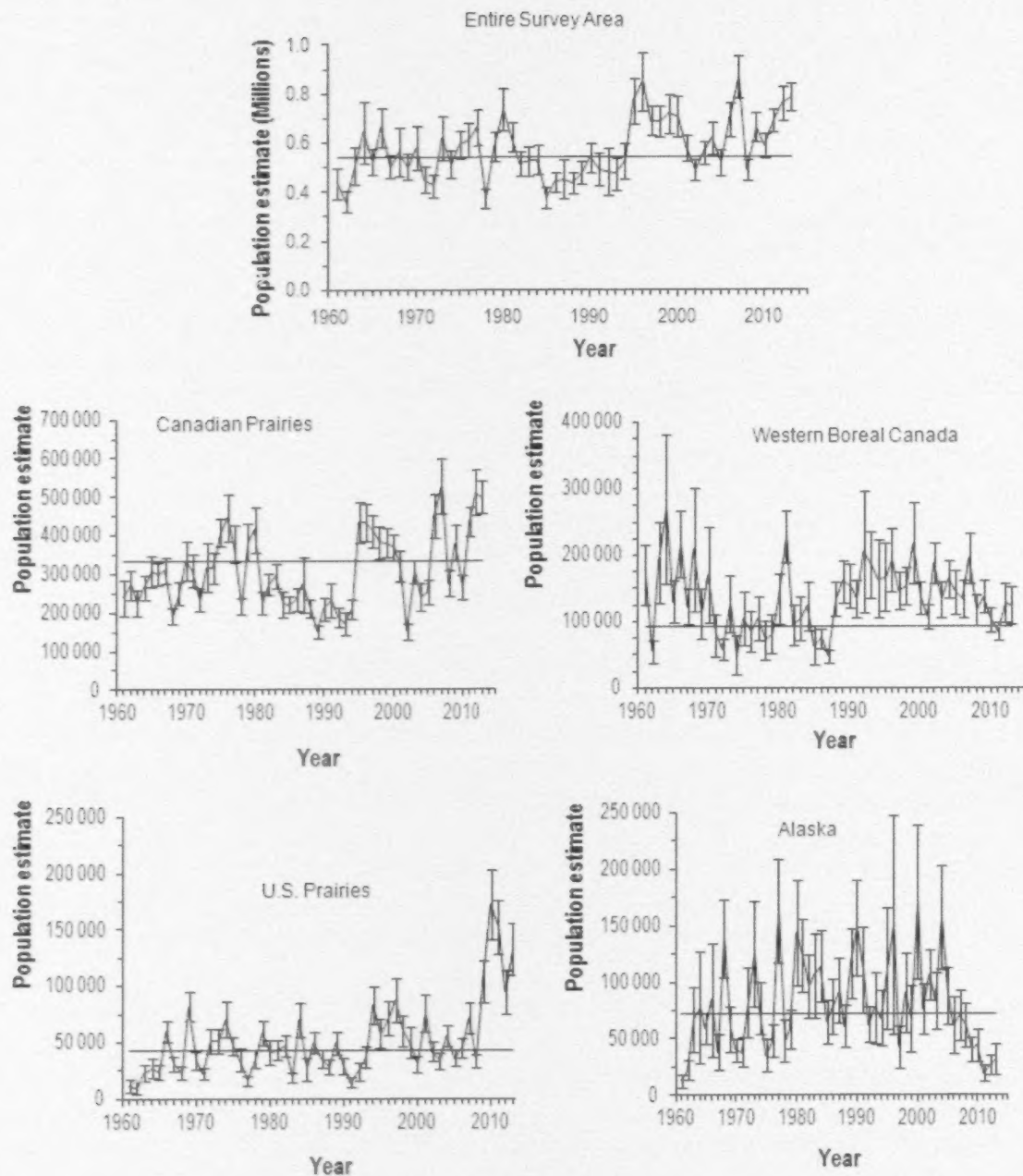


Figure 16. Canvasback Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
Data shown are estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

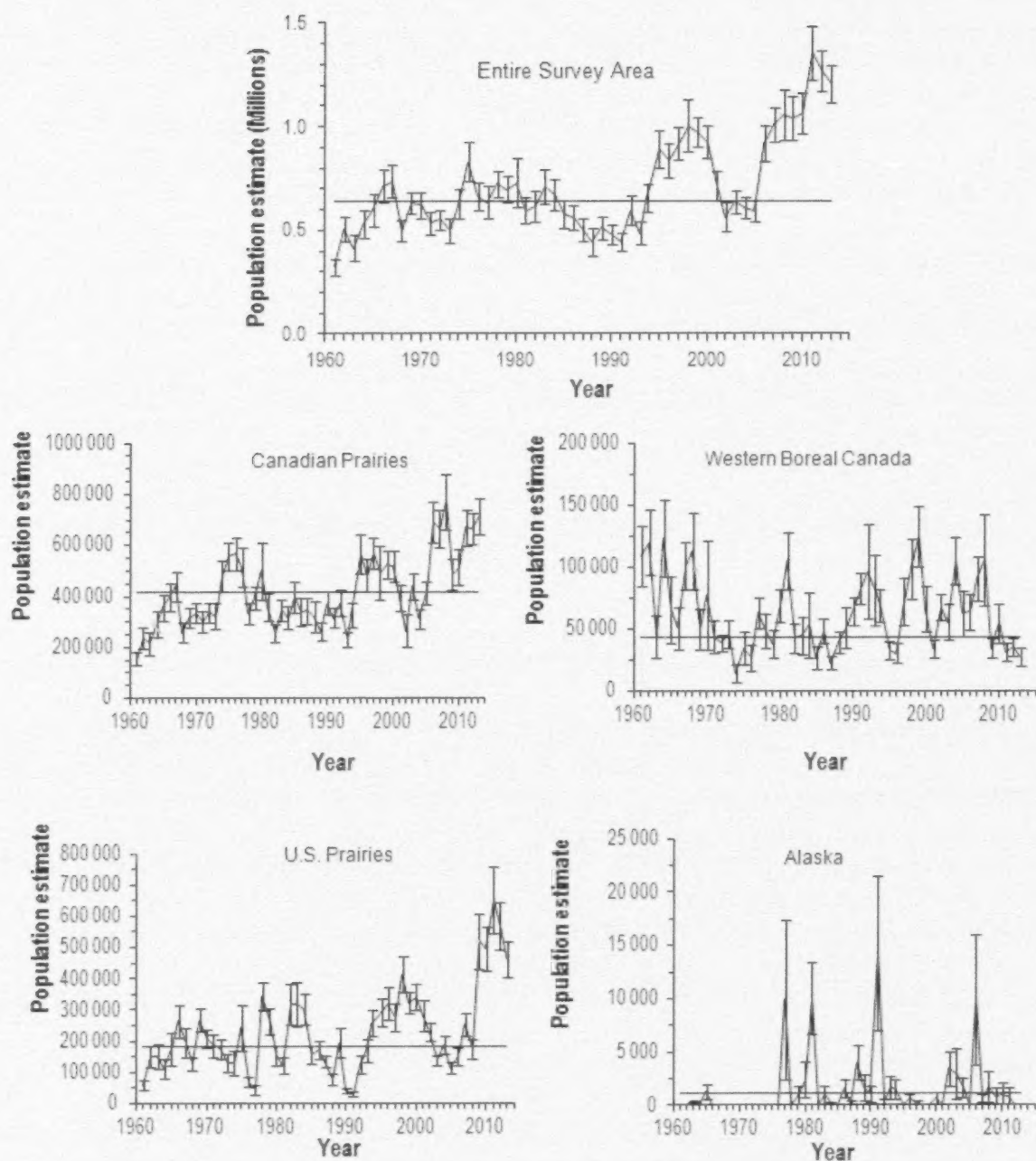


Figure 17. Redhead Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
Data shown are estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

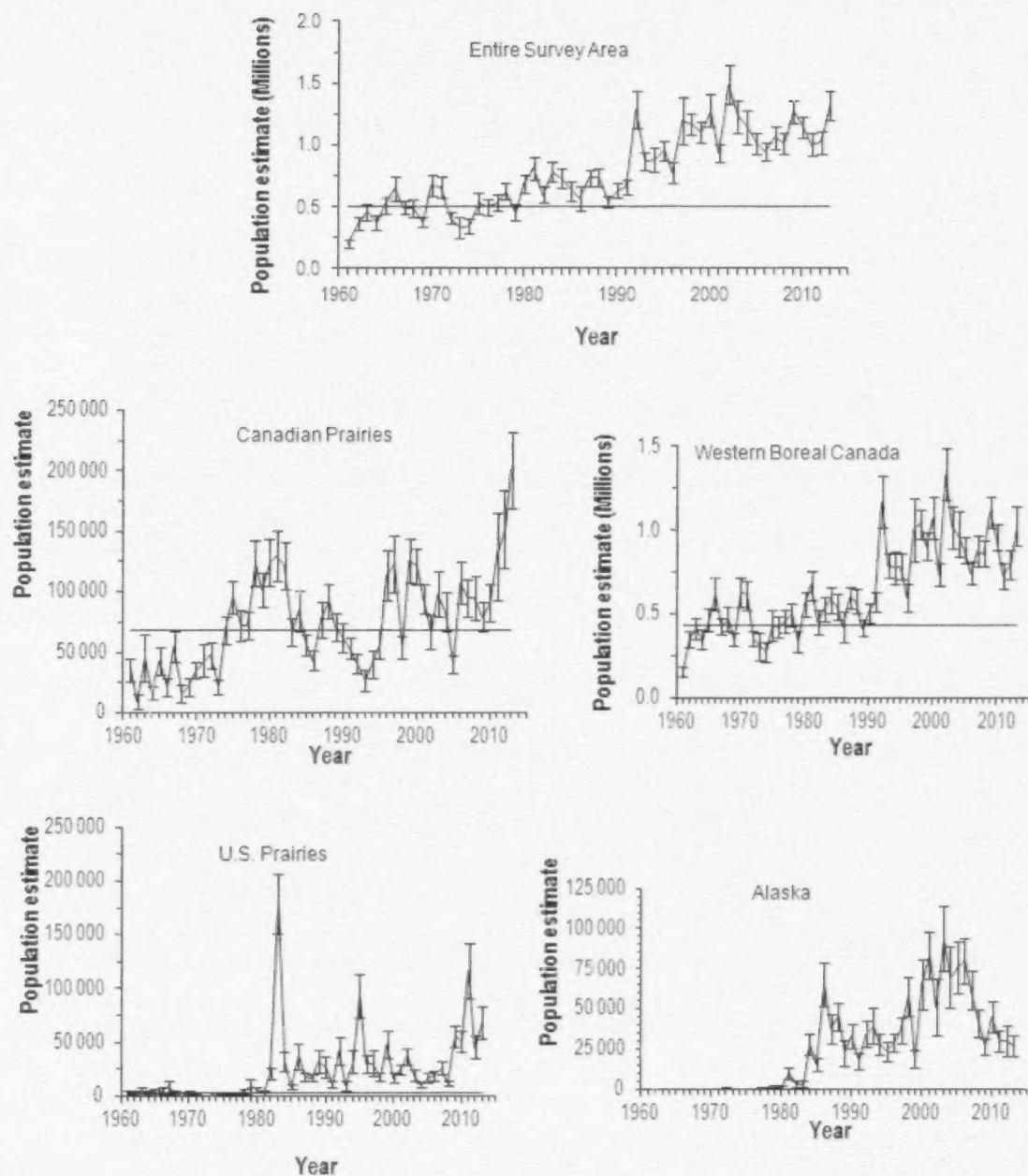


Figure 18. Ring-necked Duck Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
Data shown are estimates (± 1 SE). The horizontal line represents the NAWMP population goal.

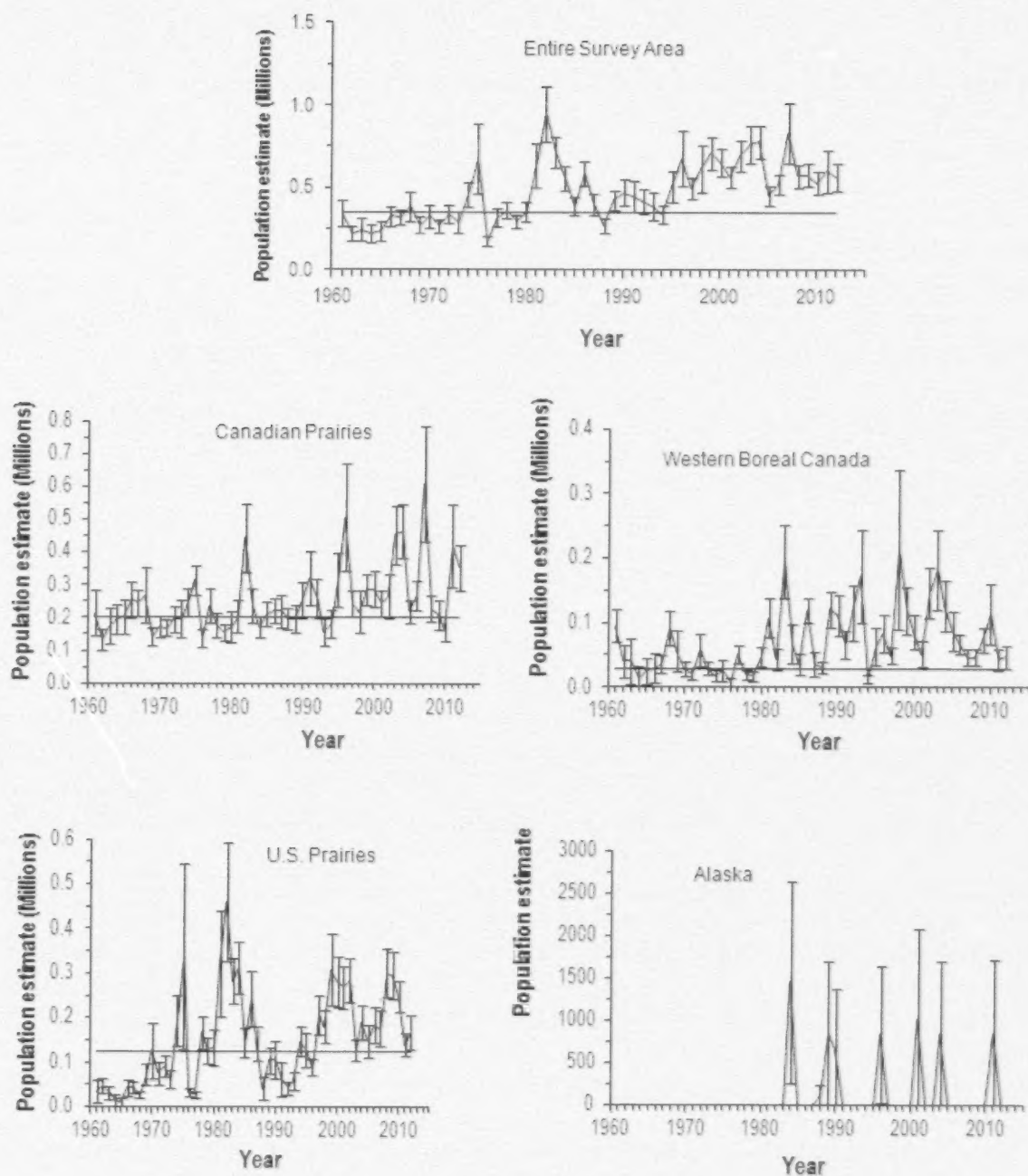


Figure 19. Ruddy Duck Breeding Populations in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey
 Data shown are estimates (± 1 SE). The horizontal line represents the NAWMP population goal. (No data were available in 2013).

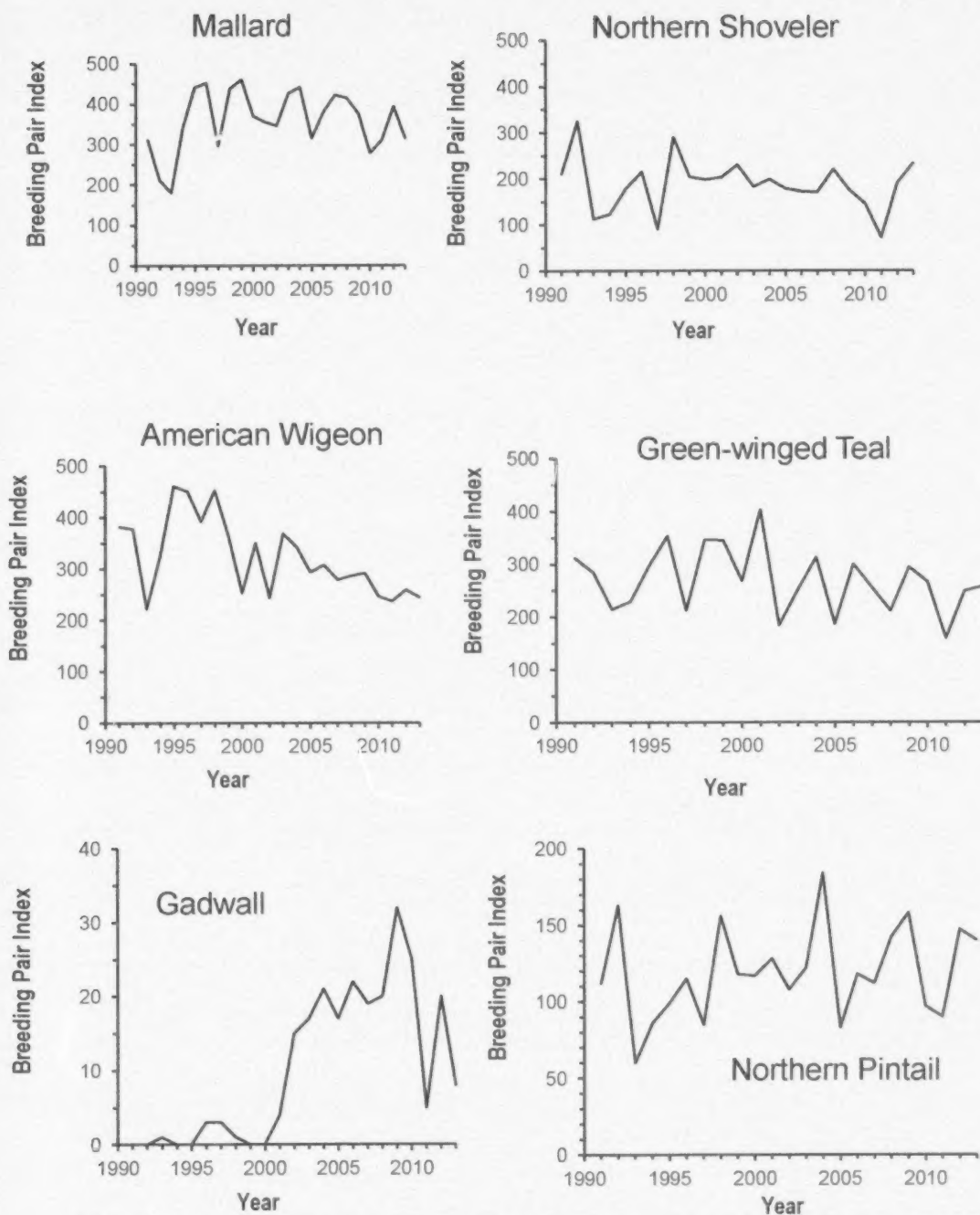


Figure 20. Breeding Pair trends for Dabbling Ducks in Southern Yukon 1991-2013
(J. Hawkings, 2032, pers. comm.).

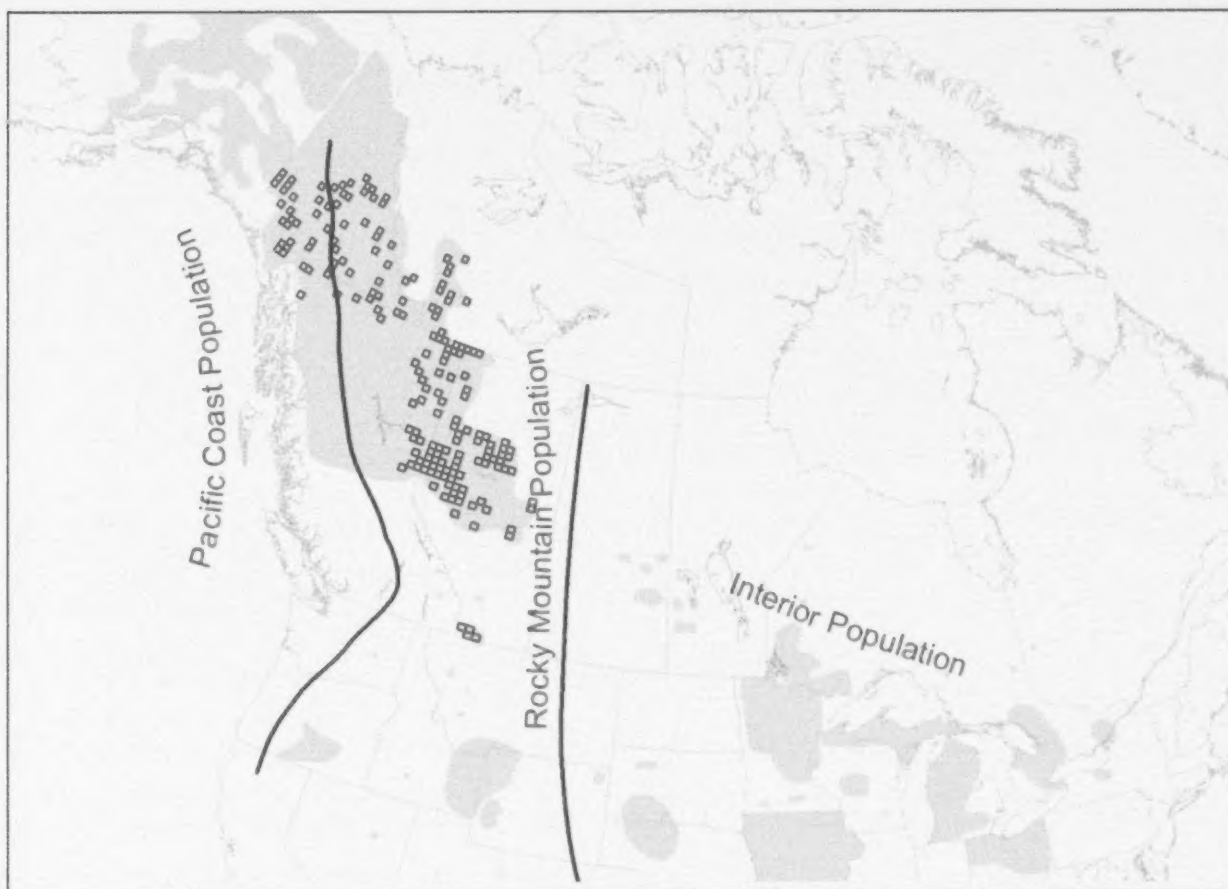


Figure 21. 2010 Breeding Distribution of Trumpeter Swan Populations in North America, Showing Individual Maps Sampled in Western Canada as Part of the 2010 North American Trumpeter Swan Survey
(Source: Groves 2012 USFWS)

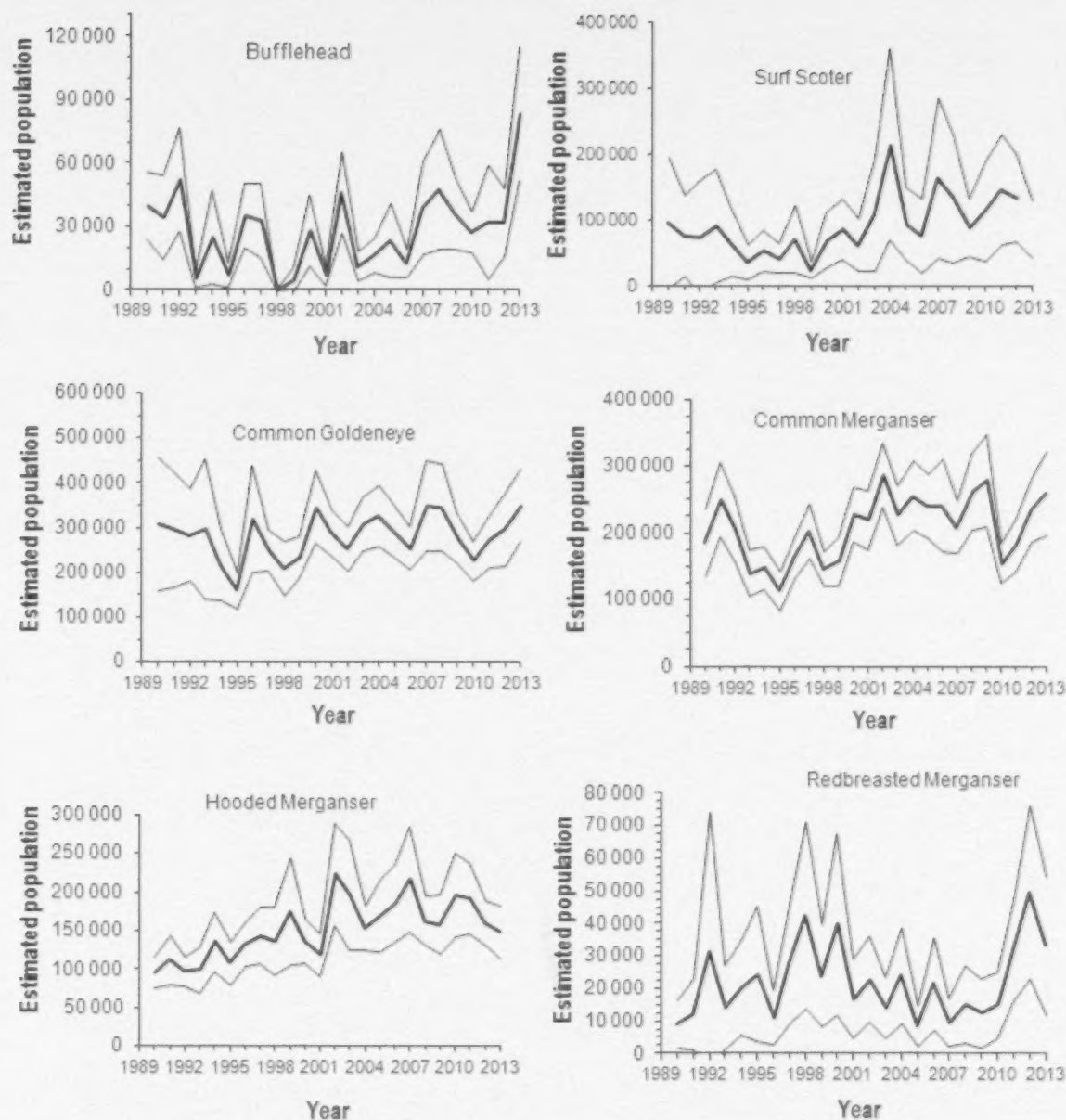


Figure 22. Bufflehead, Surf Scoter, Common Goldeneye, Common Merganser, Hooded Merganser and Red-breasted Merganser in the Eastern Waterfowl Survey Area
The figures represent results from the helicopter surveys only (estimate and 90% credible intervals).

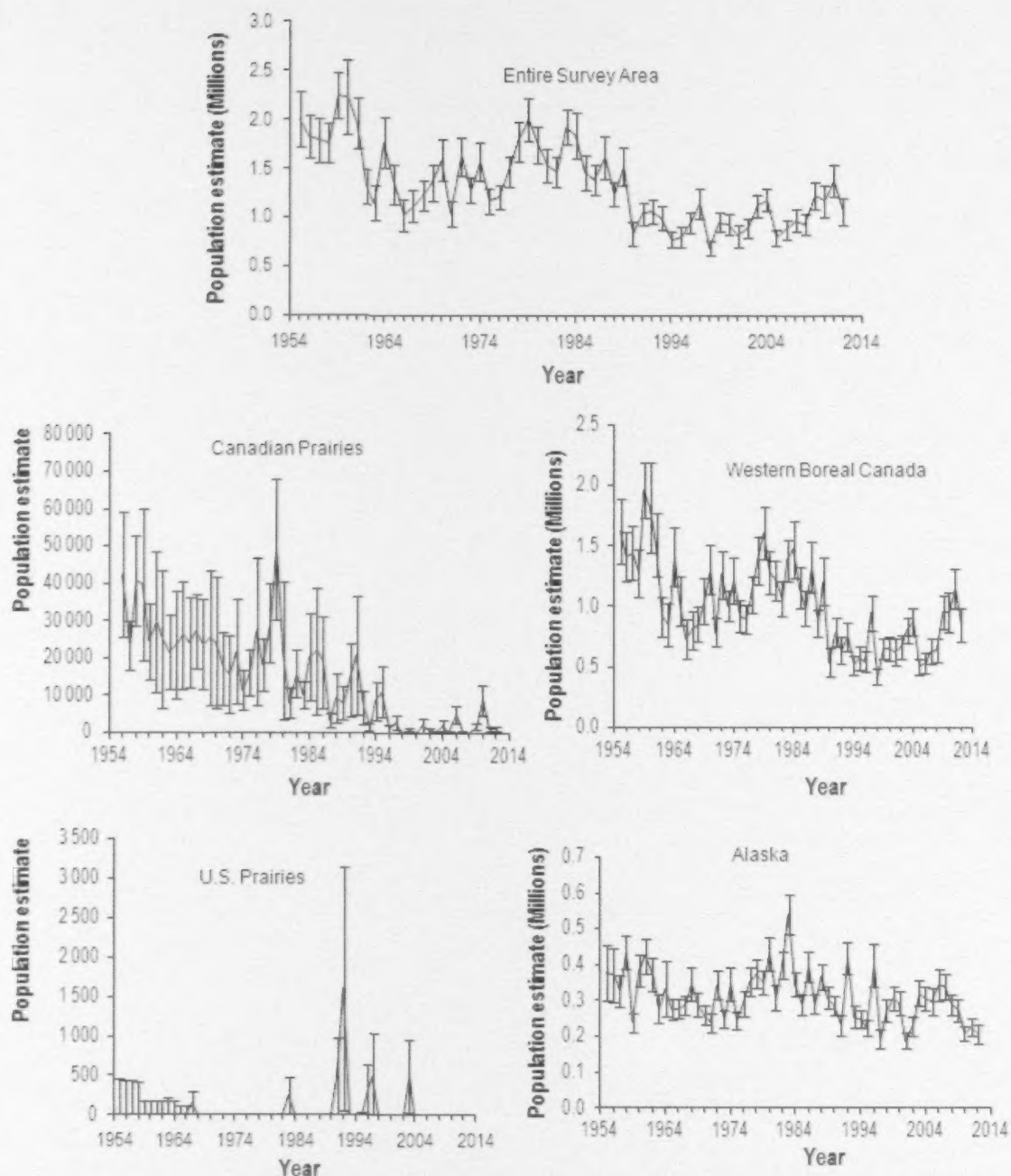


Figure 23. Scoter spp. Breeding Population Estimates in the Traditional Survey Area of the Waterfowl Breeding Population and Habitat Survey

Data shown are population estimates (± 1 SE).

The horizontal line represents the NAWMP population goal.

(No data were available in 2013)

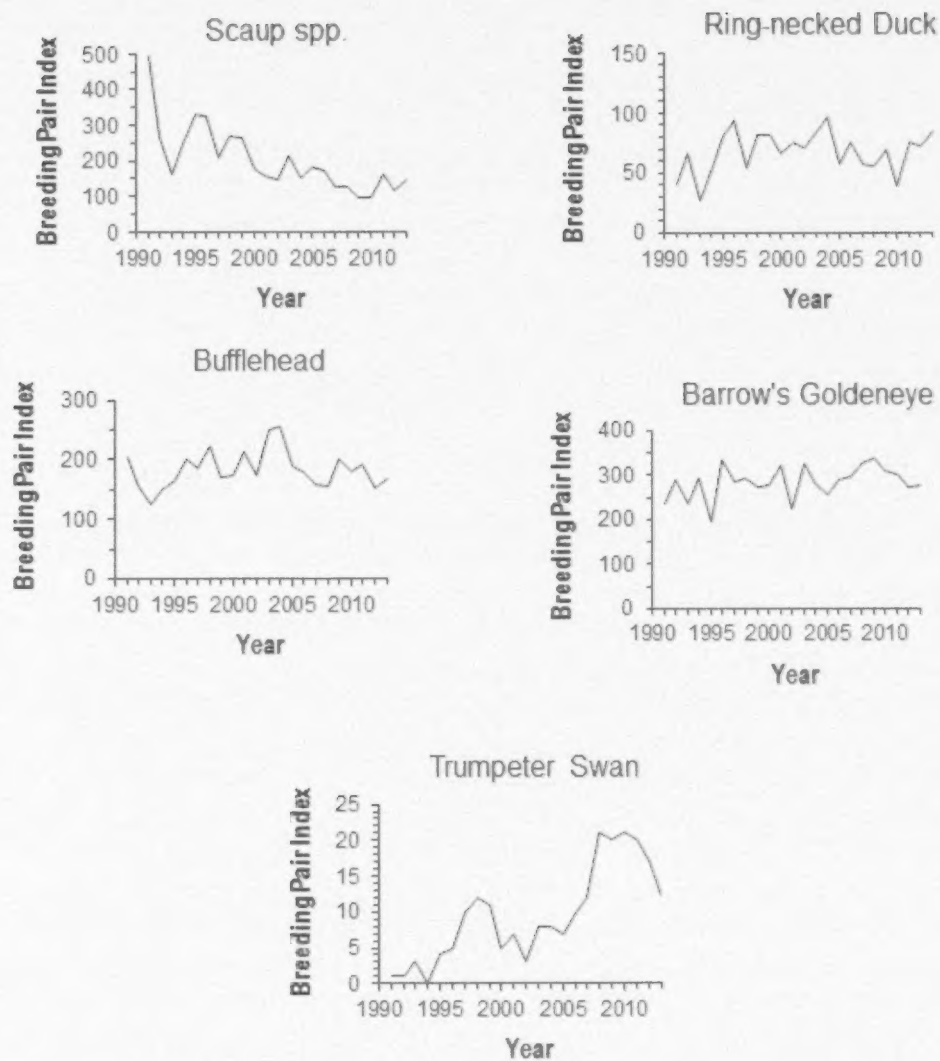
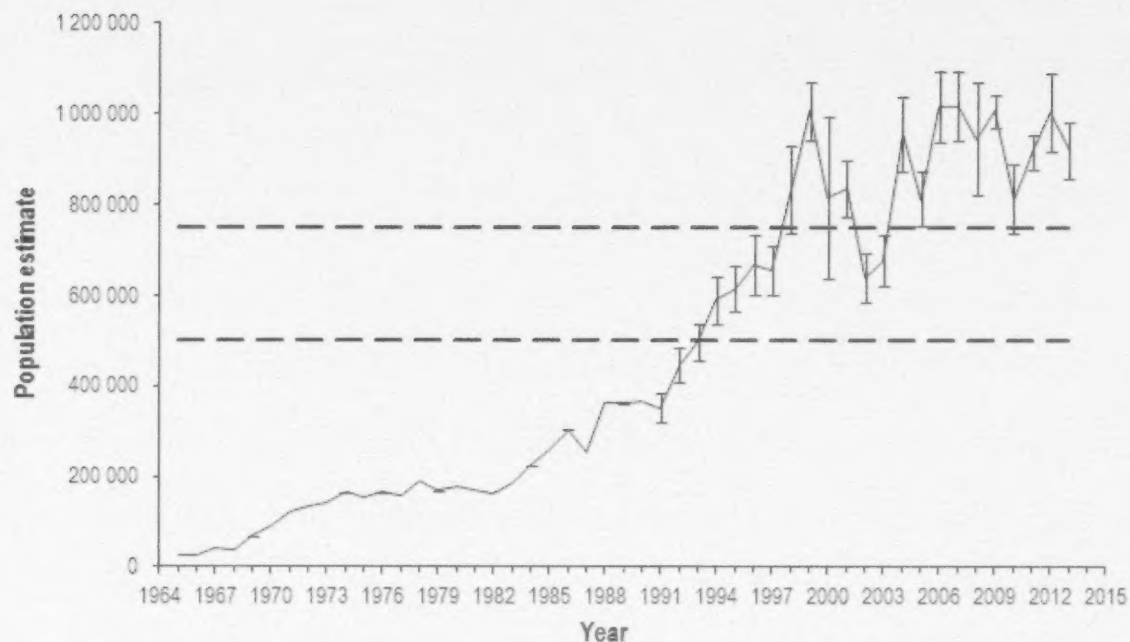


Figure 24. Breeding Pair trends for Diving Ducks, Seaducks and Trumpeter Swan in Southern Yukon 1991-2013

(J. Hawkings, CWS, 2013, pers. comm.).



**Figure 25. Greater Snow Geese Spring Population Estimates (95% CI)
in the St. Lawrence River Valley**

The horizontal lines represent the target range for the population.

(Source: Lefebvre 2013)

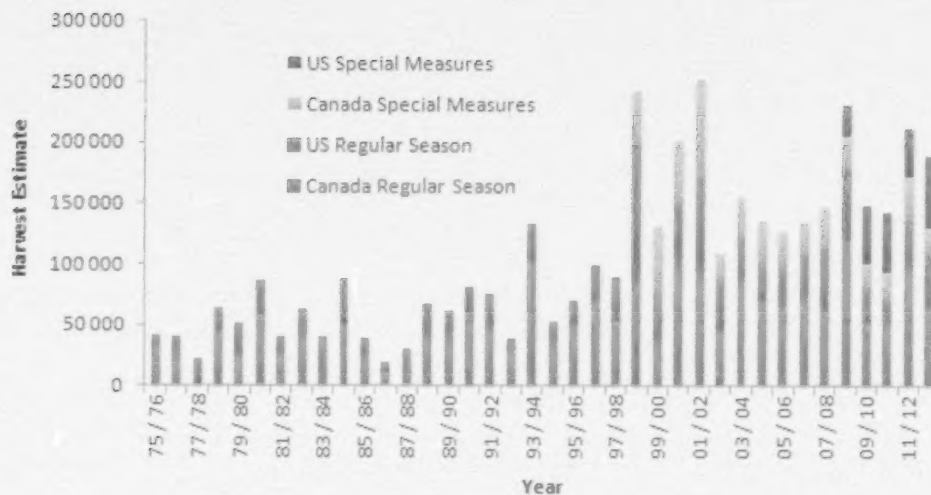


Figure 26. Harvest of Greater Snow Geese
 Numbers include geese harvested during special conservation measures initiated in spring 1999 in Canada and 2009 in the United States.
 (Source: Smith and Gendron 2013; and Raftovich and Wilkins 2013)

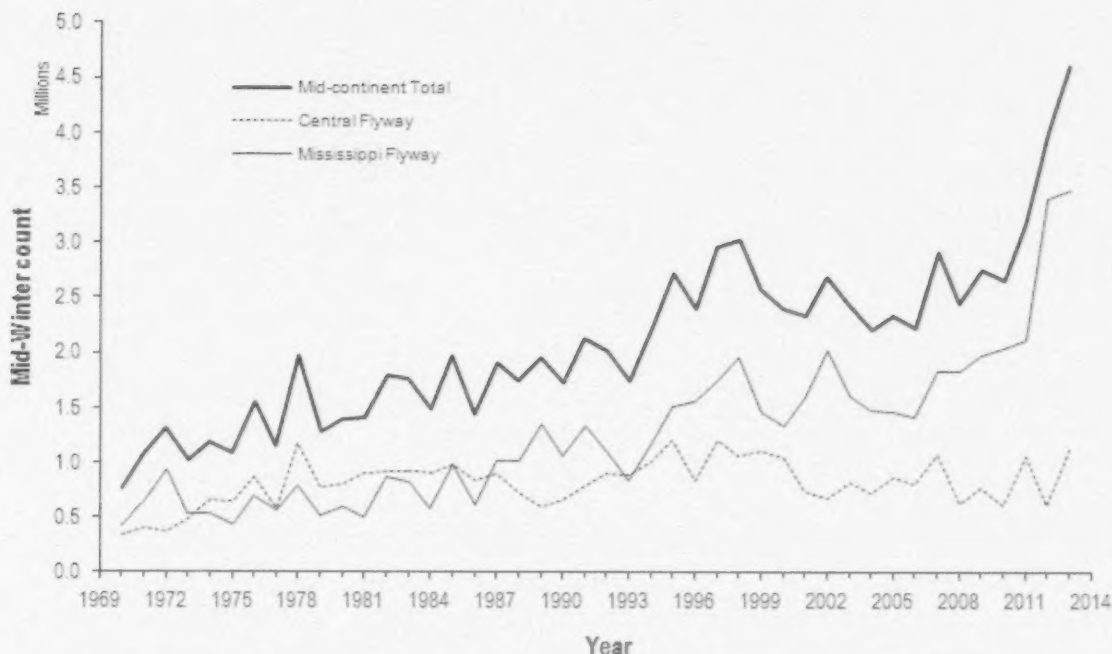


Figure 27. Mid-continent Lesser Snow Geese Populations in Mid-winter
 Counts include some Ross' Geese.
 (Source: Fronczak 2013)

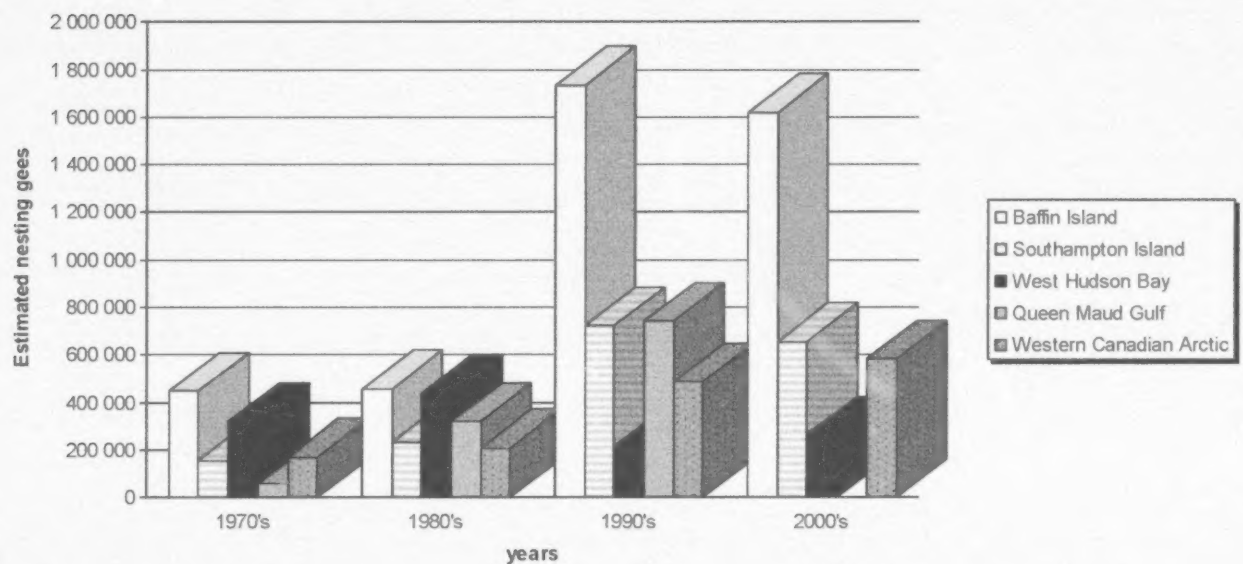


Figure 28. Number of Nesting Lesser Snow Geese Estimated Through Photo-inventories of Major Breeding Colonies in Canada

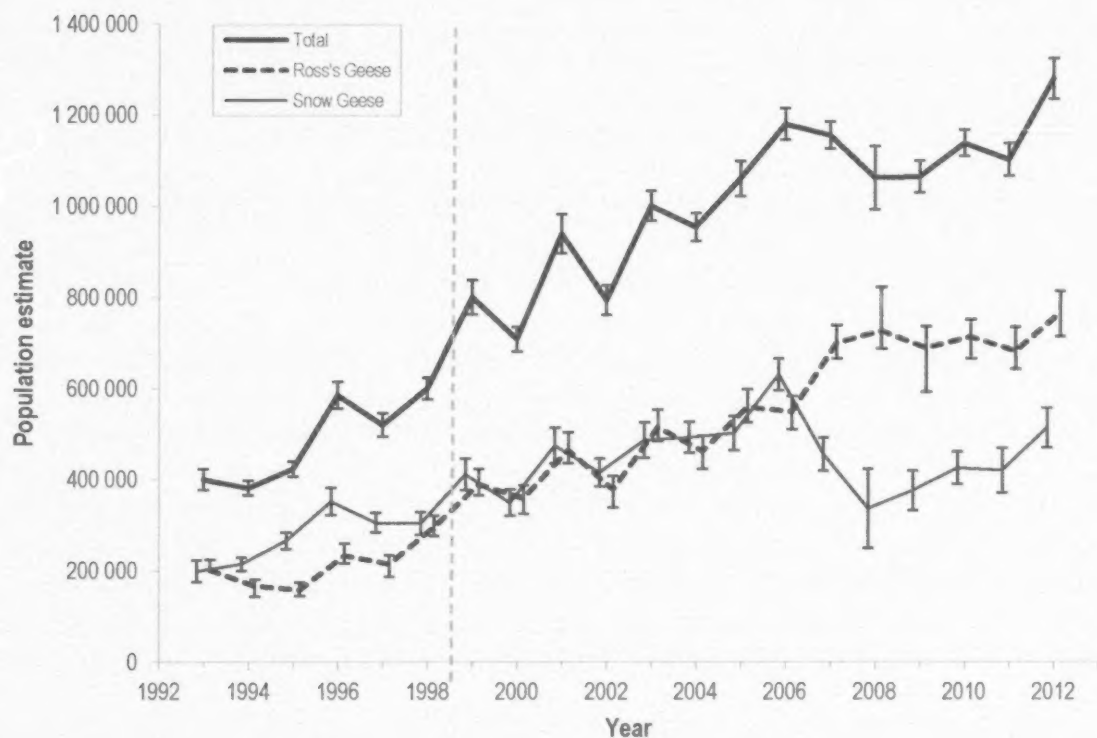


Figure 29. Estimates for numbers of Ross's and Lesser Snow Geese that attempted to nest at Karrak Lake, 1993–2012. The vertical line represents the start of special conservation measures for overabundant Snow Geese.

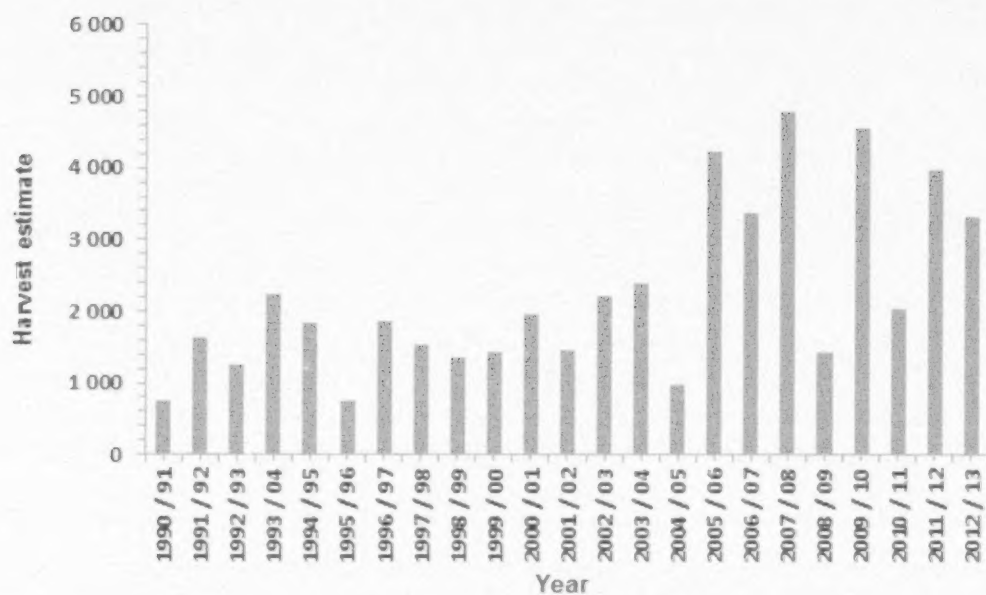


Figure 30. Lesser Snow Geese Harvest Estimates for the Wrangel Island Population

Estimates include a +20% adjustment for cripple loss.

(Source: A. Breault, CWS, Pacific and Yukon Region).

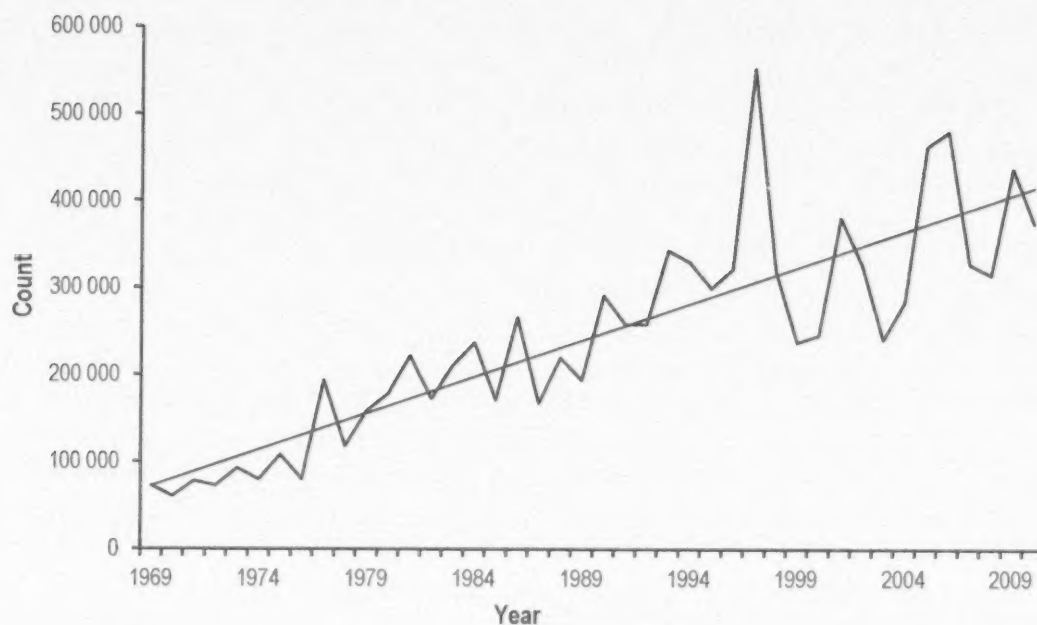


Figure 31. Midwinter counts of mid-continent White-fronted Geese in the Central and Mississippi Flyways, 1969–2011

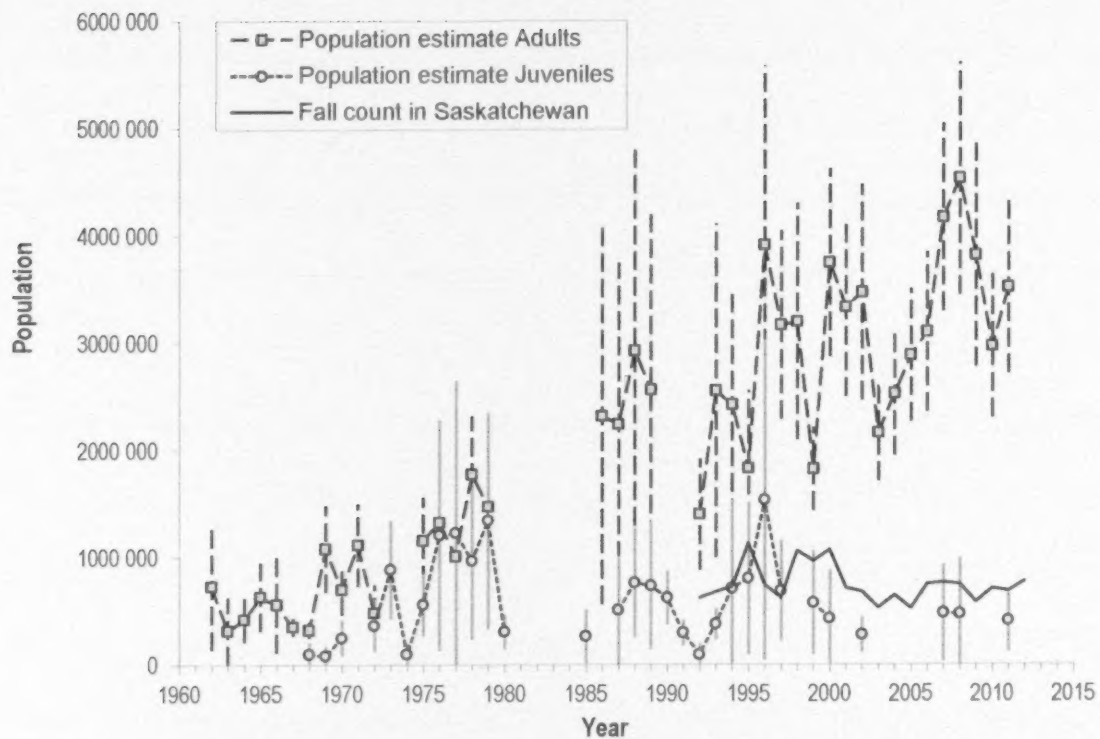


Figure 32. Lincoln population estimates of mid-continent White-fronted Geese, 1975-2010, compared to the fall survey index from 1992-2011 (the fall survey was not conducted in 2013)

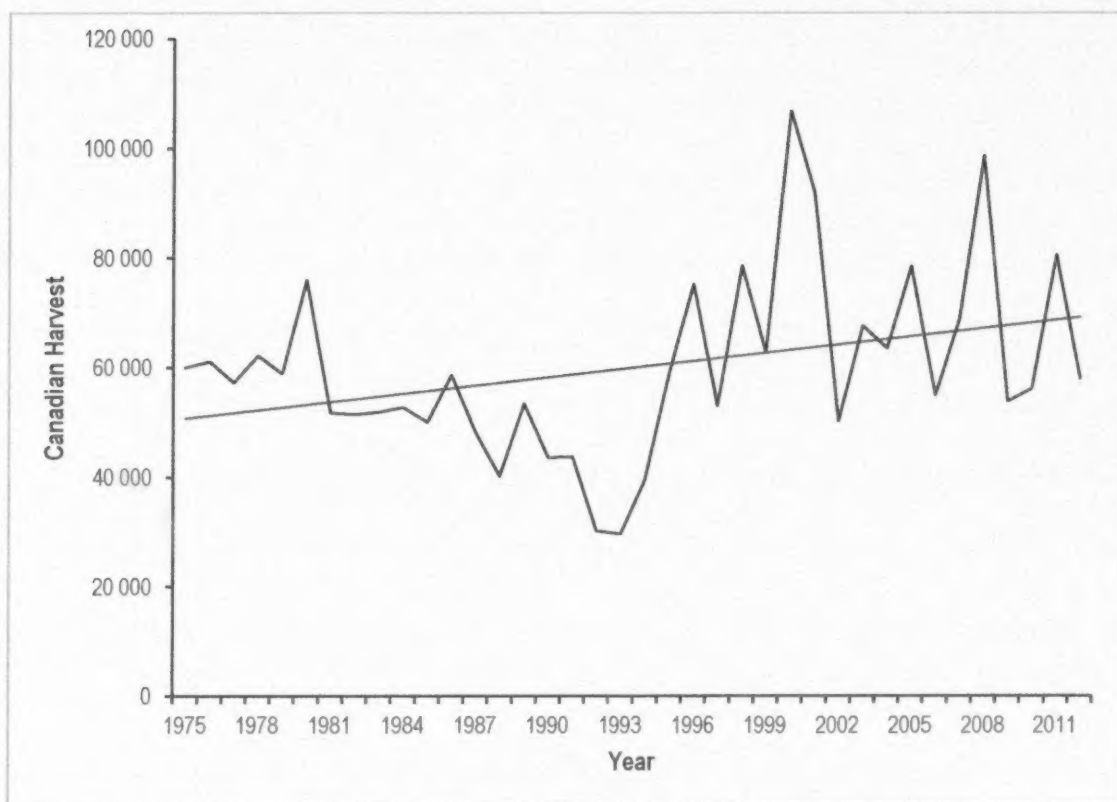
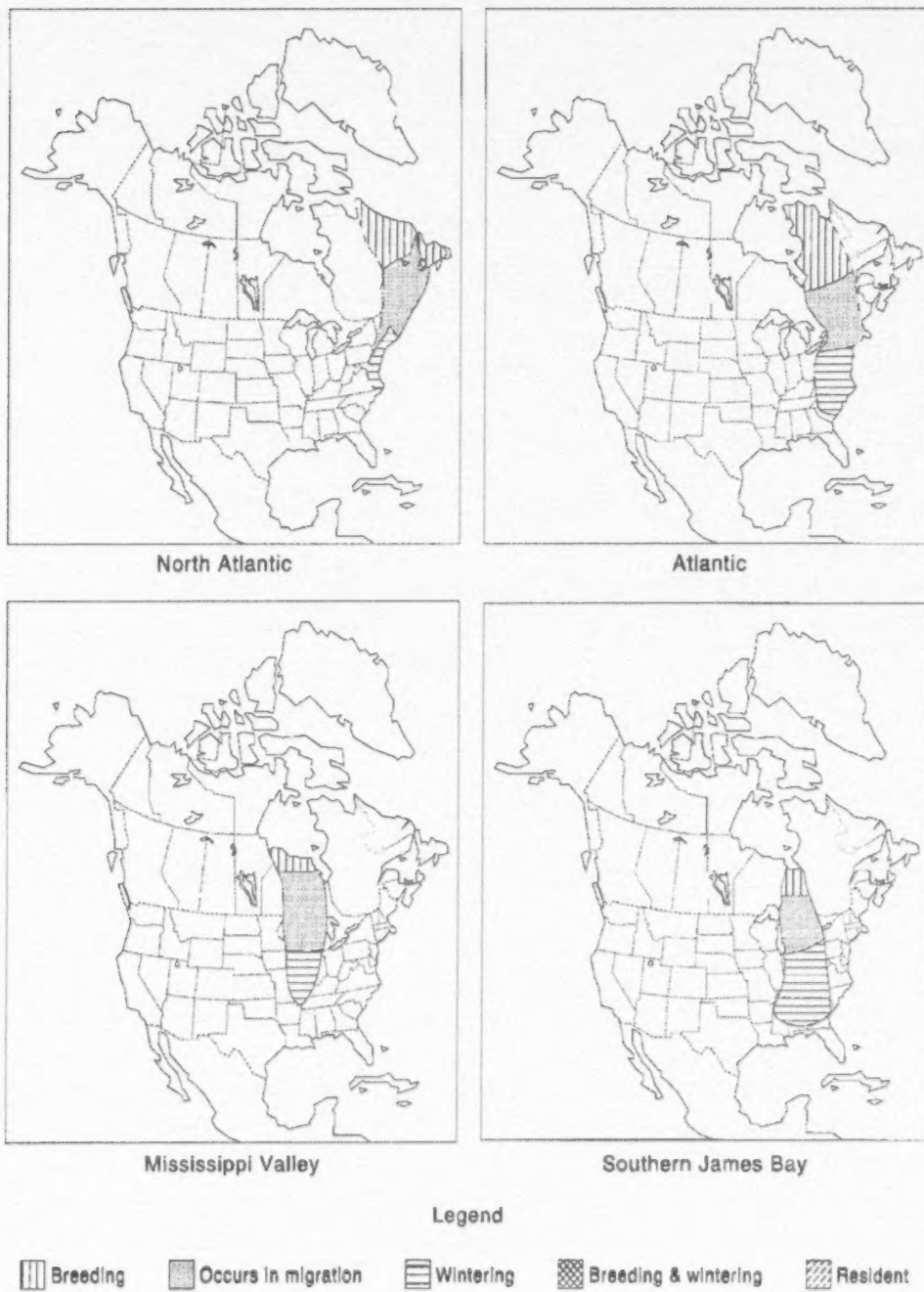


Figure 33. Annual harvests of mid-continent White-fronted Geese in Alberta and Saskatchewan, Canada, 1975–2012 ($y = 497.53x + 50\,281$, $R^2 = 0.1089$)



(from Bellrose 1976, Palmer 1976, Rusch et al. 1996, USFWS 1996)

Figure 34a. Canada Geese Populations in North America: NAP, AP, MVP and SJBP

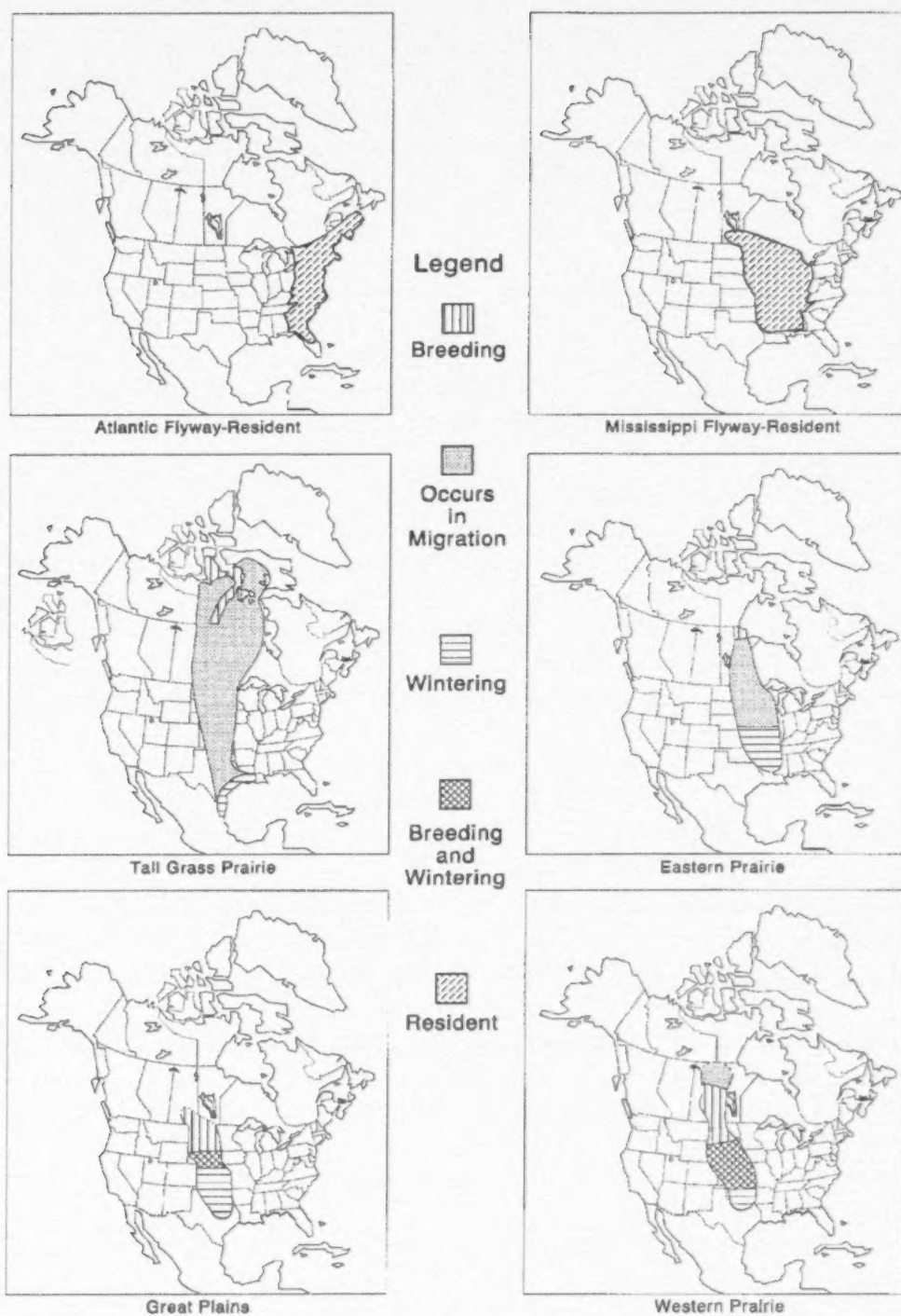


Figure 34b. Canada Goose Populations in North America: AFRP, MFRP, EPP, GPP and WPP. Cackling Goose Population: TGPP.

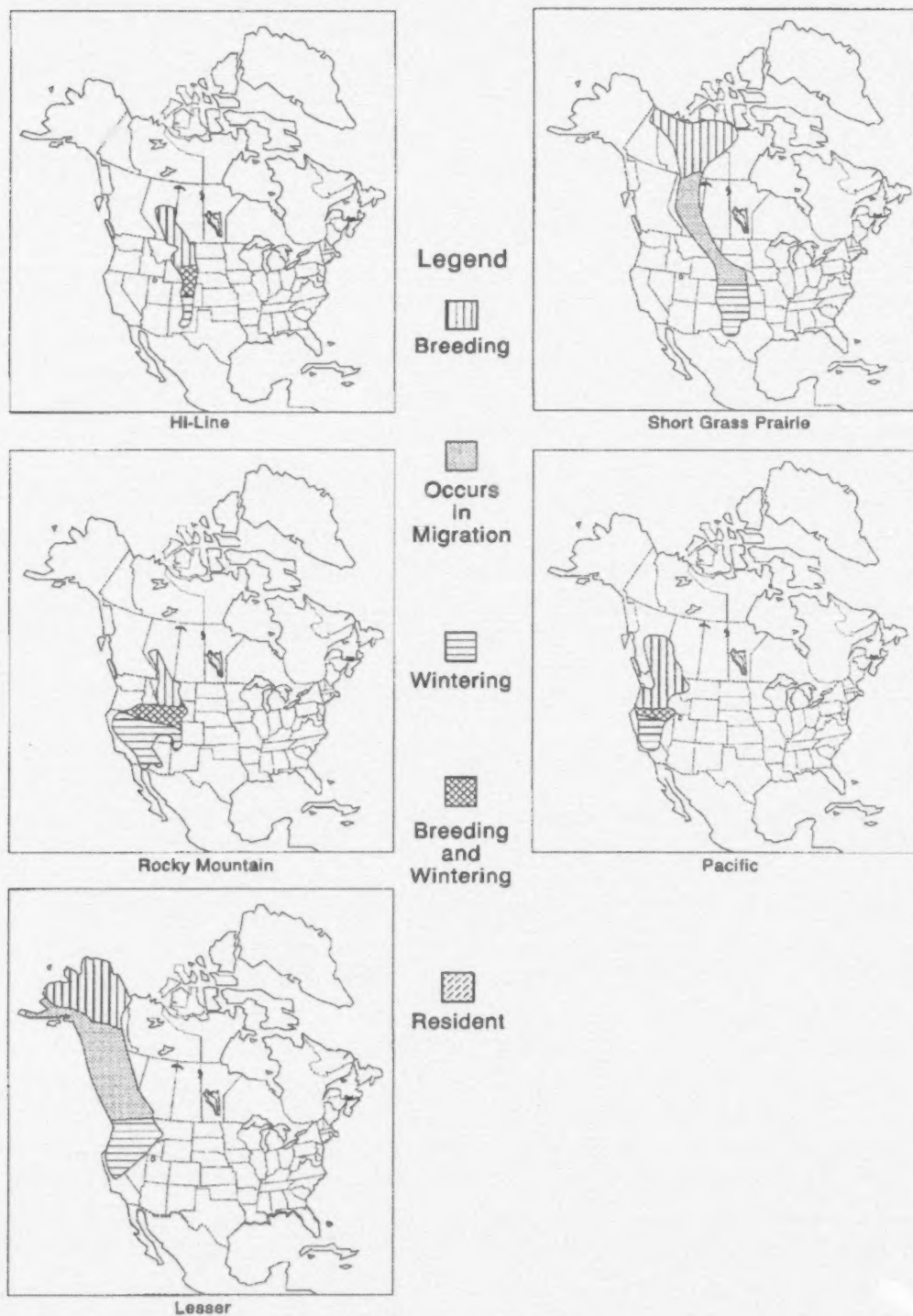


Figure 34c. Canada Geese Populations in North America: HLP, RMP, PP and LP.
Mixed Cackling/Canada Geese Population: SGPP.

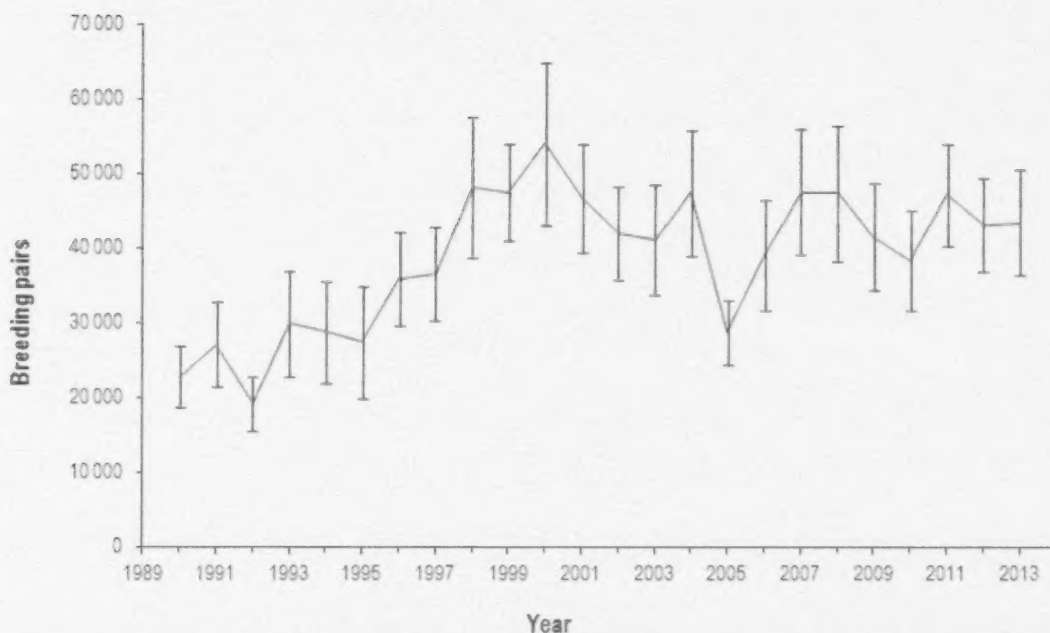


Figure 35. Breeding Pairs of the North Atlantic Population Canada Geese in Stratum 2 of the Eastern Waterfowl Survey Area (see Figure 1)
(Breeding pairs ± 1 ET), Source: Adam Smith, CWS, National Capital Region)

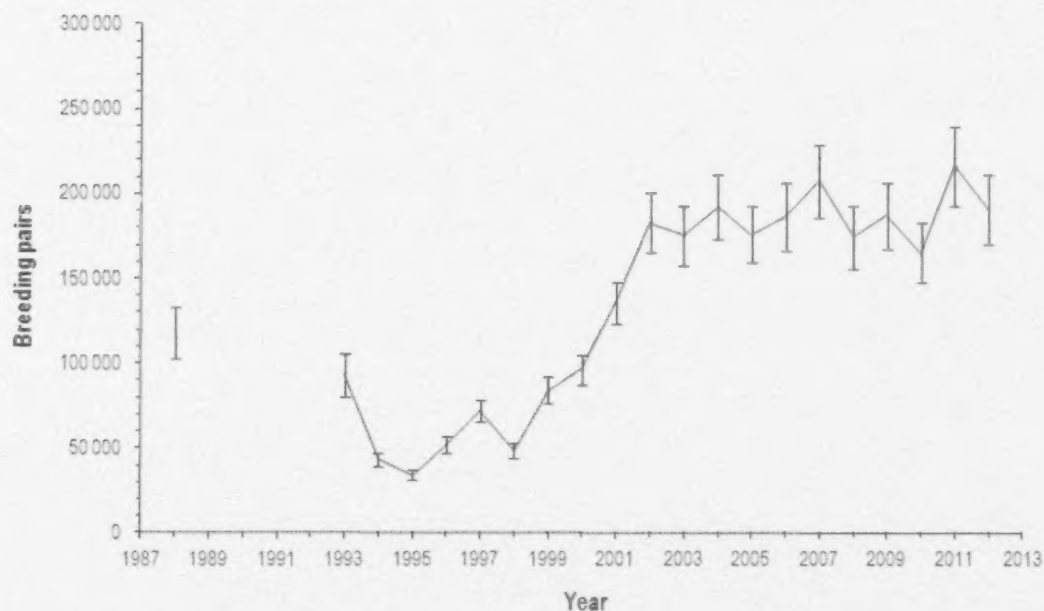


Figure 36. Breeding Pairs of the Atlantic Population Canada Geese in the Ungava Peninsula of northern Quebec
Breeding pairs ± 1 SE. (Source: Harvey and Rodrigue 2012)
No surveys were conducted from 1989–1992, and in 2013.

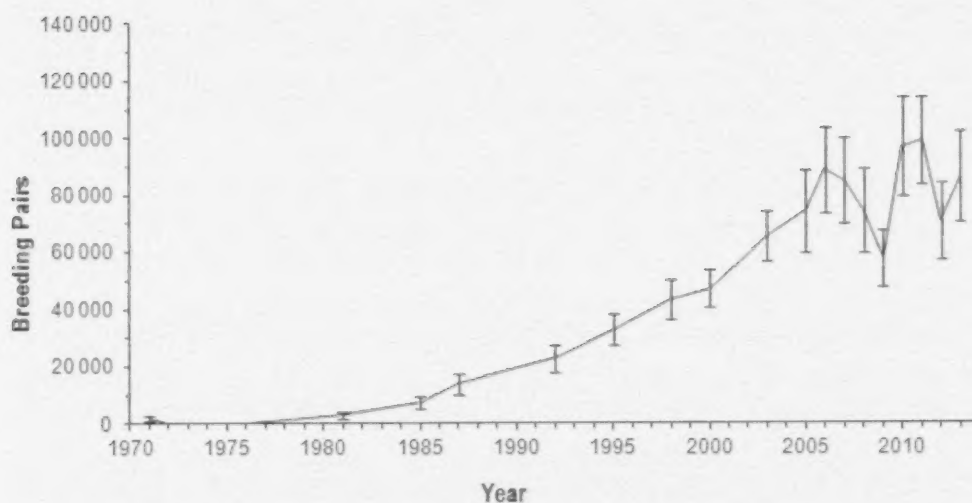


Figure 37. Estimated Breeding Pairs of Temperate-breeding Canada Geese (± 1 SE) in Southern Ontario Population, 1971–2013
(Source: S. Meyer, CWS, Ontario Region)

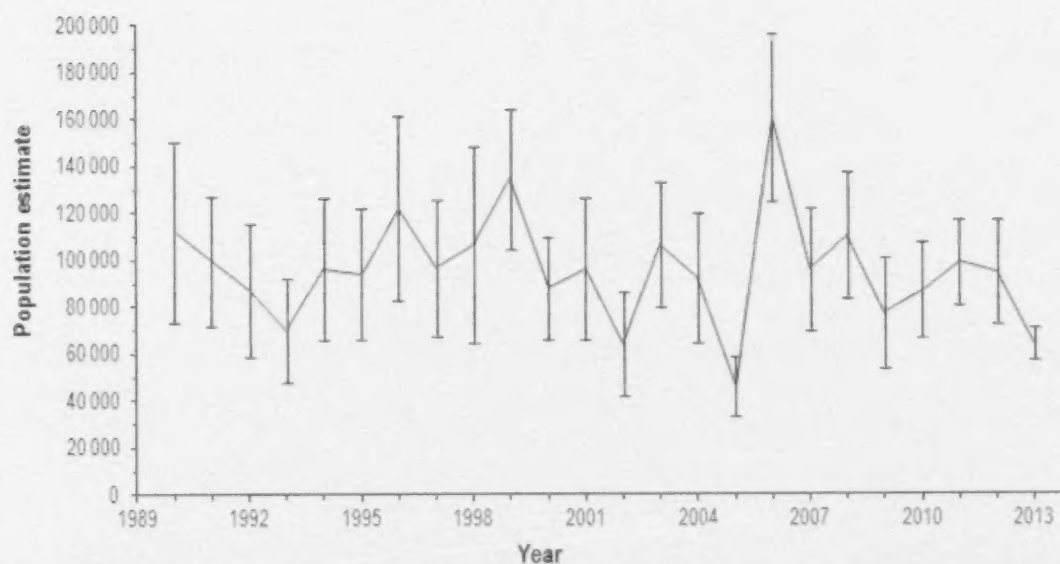


Figure 38. Southern James Bay Population Canada Geese Spring Estimates ($\pm 95\%$ CI)
Changes in the survey design made the population estimates since 2007 not directly comparable to those of previous years (Source: Brook and Hughes 2012a).

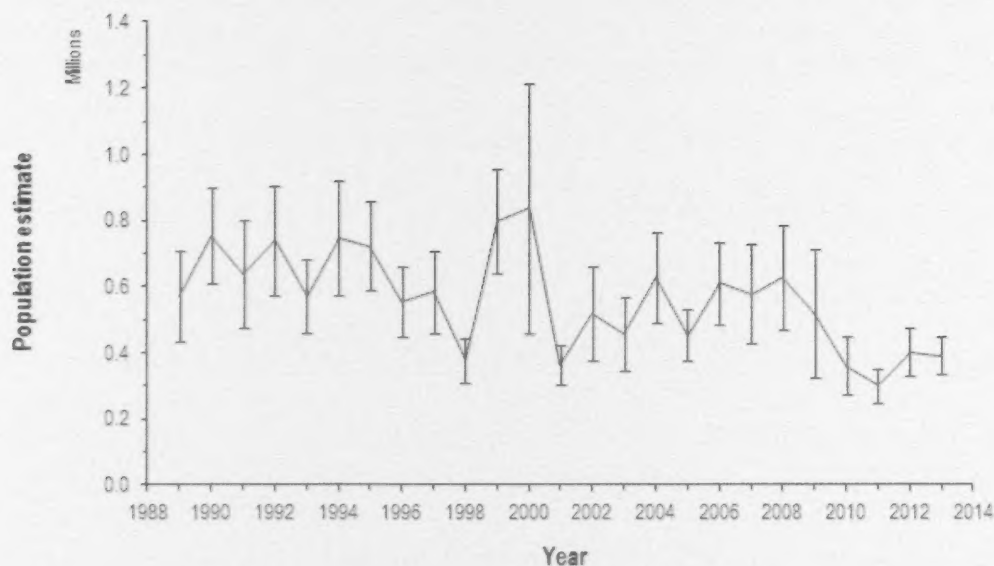


Figure 39. Mississippi Valley Population Canada Geese Spring Estimates (\pm 95% CI)
 (Source: Brook and Hughes 2013b)

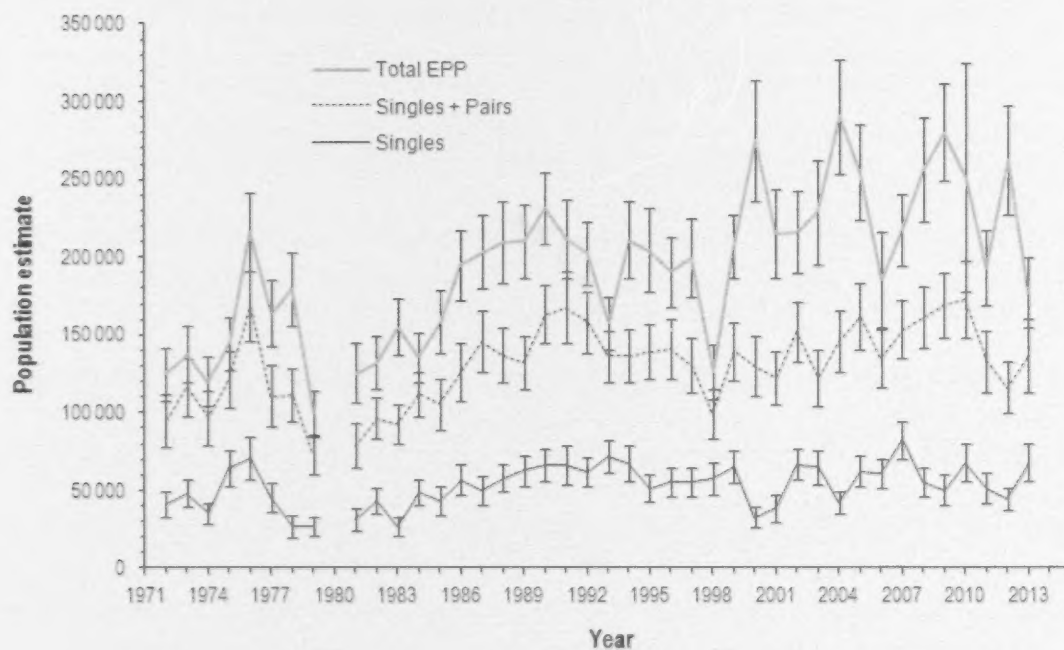


Figure 40. Eastern Prairie Population Canada Geese Spring Estimates (\pm 95% CI)
 No survey was conducted in 1980.
 (Source: D. Fronczak 2013)

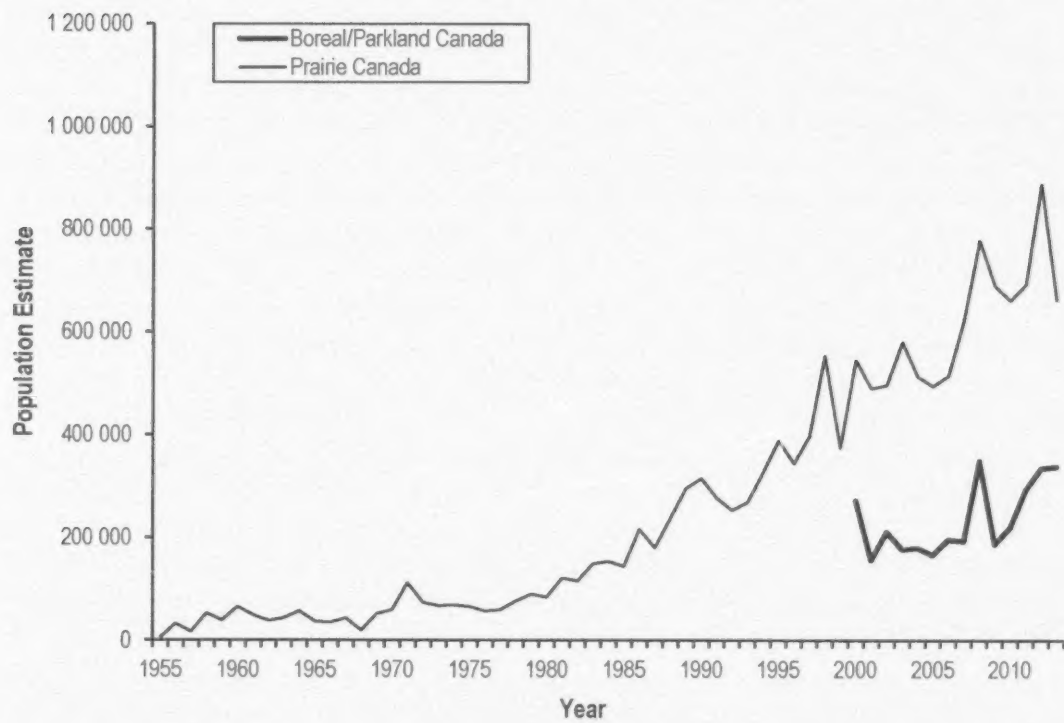


Figure 41. Canada Geese Population Estimate, Prairies, Boreal and Parkland of Western Canada (1955–2013)



Figure 42. Map of the breeding range of mid-continent Cackling Geese

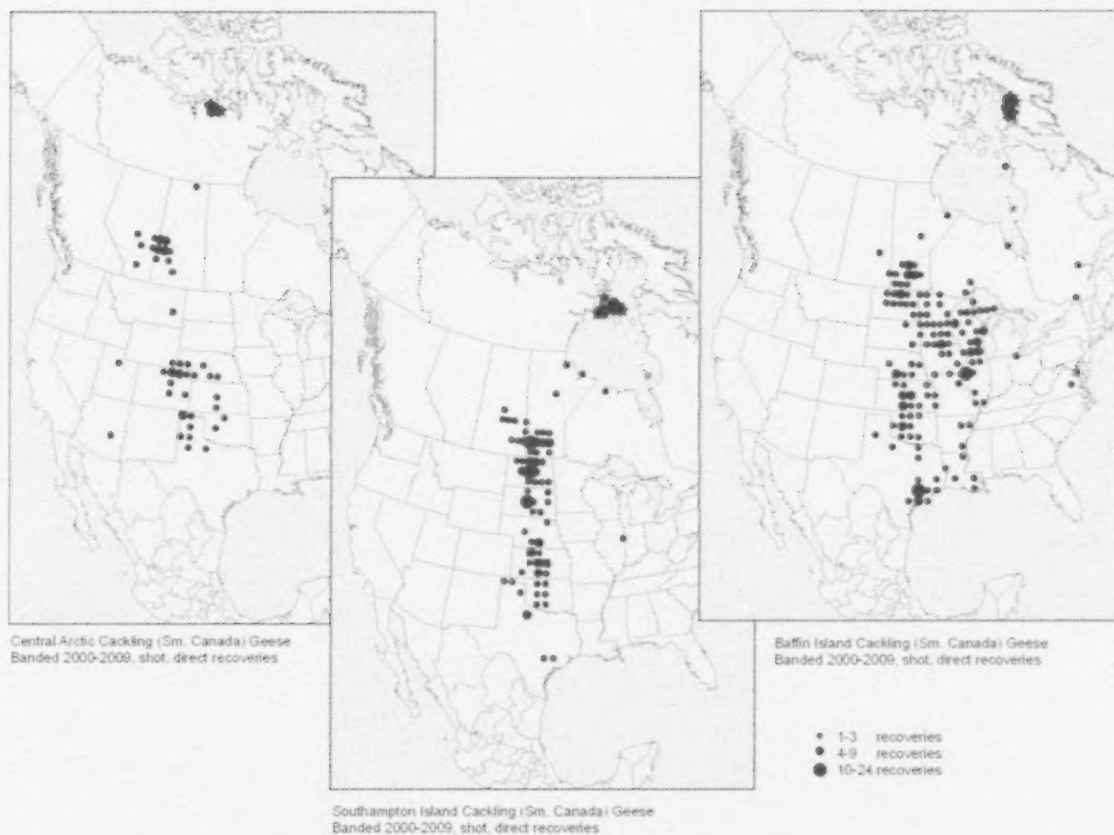


Figure 43. Longitudinal variation in band recovery distributions of Cackling Geese marked in different regions of the Canadian arctic. Only direct recoveries of shot birds that were banded from 2000–2009 are included.

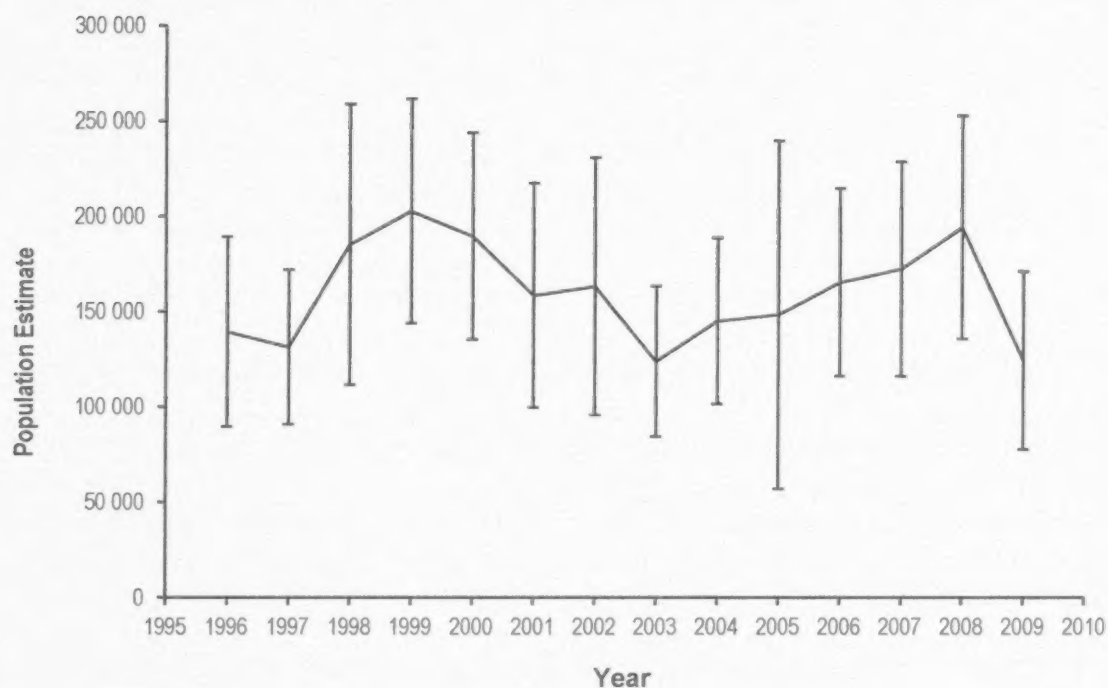


Figure 44. Estimated number of adult Cackling Geese on the Great Plain of the Koukdjuak, Baffin Island, Nunavut-based on August helicopter surveys, 1996–2009

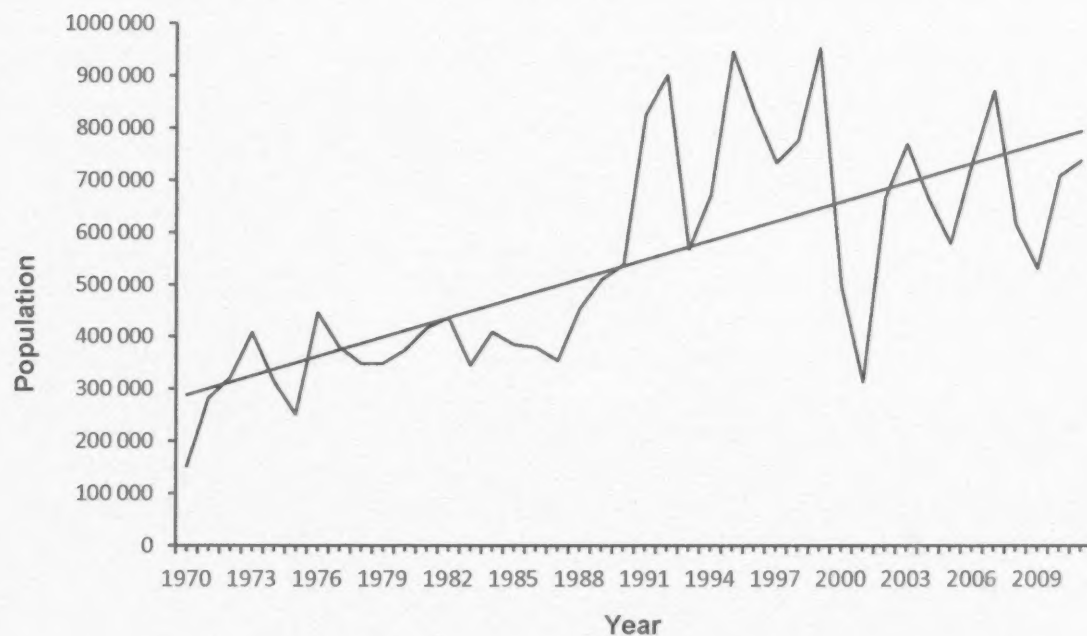


Figure 45. Midwinter counts of Cackling Geese in the Central and Mississippi Flyways, 1970–2011 ($y = 12\,323x + 276\,134$, $R^2 = 0.5138$)

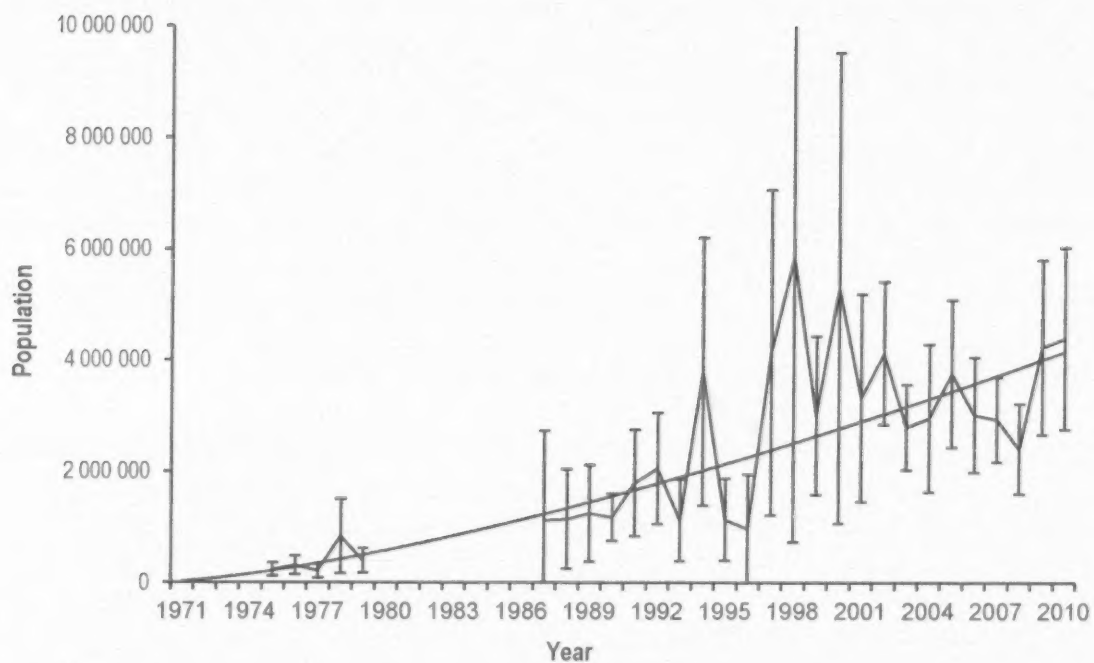


Figure 46. Lincoln population estimates of mid-continent Cackling Geese, 1975–2010
 $(y = 22405x^{1.4161}, R^2 = 0.8087)$



Figure 47. Mid-winter Inventory of Atlantic Brant in the Atlantic Flyway
(Source: Klimstra and Padding, 2013)

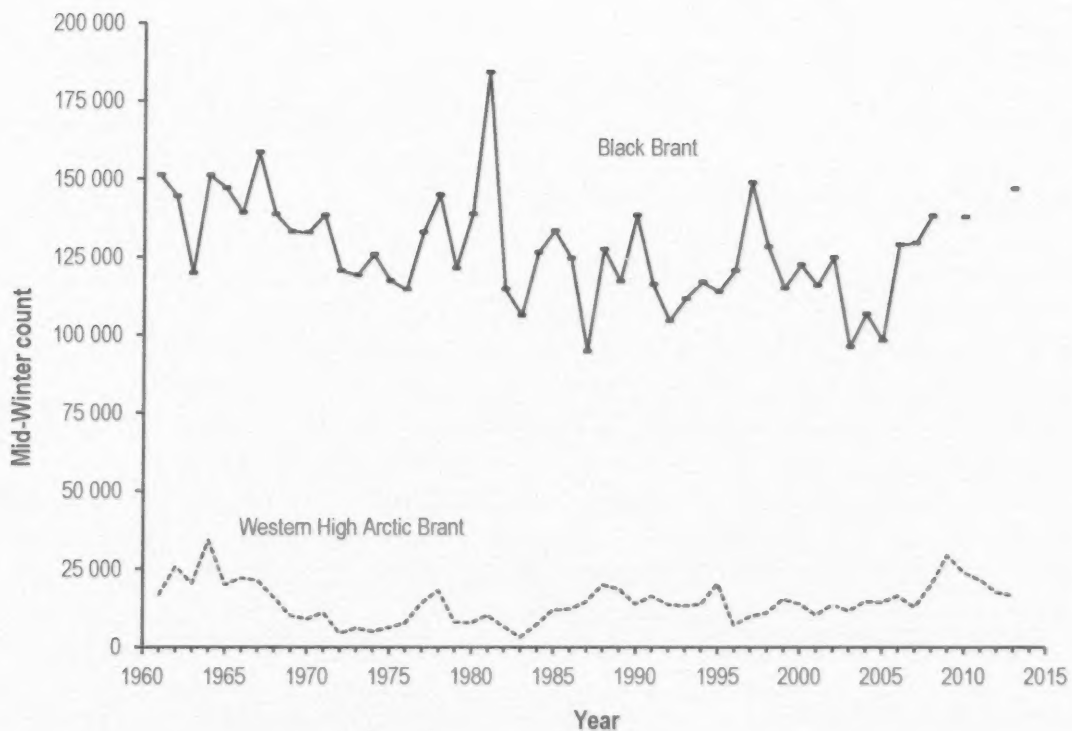


Figure 48. Mid-winter Inventory of Black and Western High Arctic Brant
Note that beginning in 1986 Black Brant numbers include counts along the Alaska coast.
No surveys conducted in Mexico in 2009, 2011 and 2012 (Source: Olson and Trost 2013).

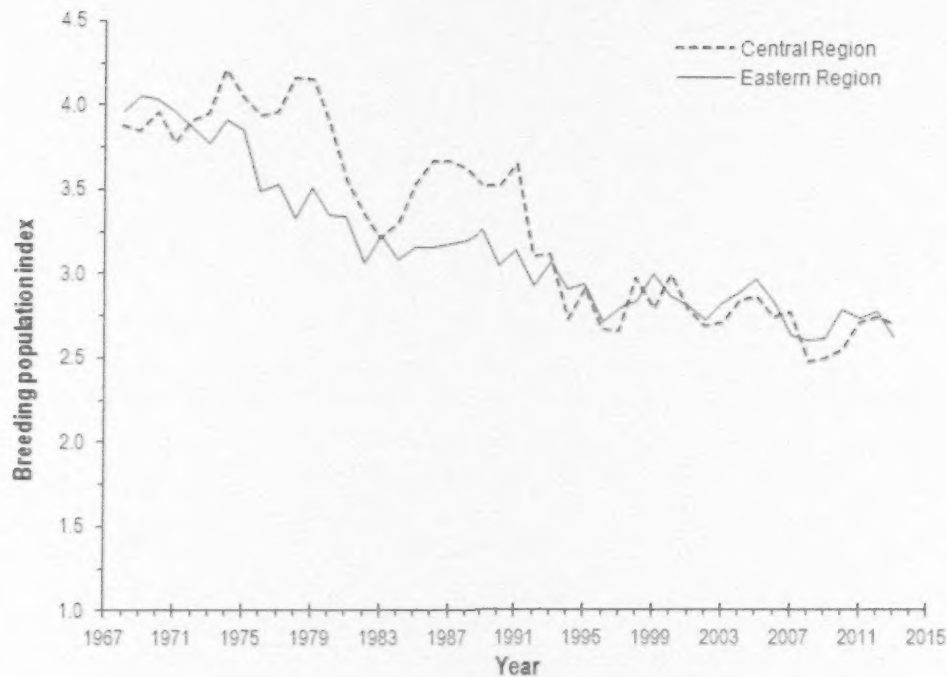


Figure 49. American Woodcock Breeding Population Indices
Indices (singing males per route) from the Singing-ground Survey.
(Source: Cooper and Rau 2013)



Figure 50. American Woodcock Harvest in Canada and the United States
The USFWS results from 1999 onward are not directly comparable to those prior to 1999.
(Source: Gendron and Smith 2013; Cooper and Rau 2013)



Figure 51. Wilson's Snipe Harvest Estimates in Canada and the United States
 The USFWS results from 1999 onward are not directly comparable to those prior to 1999.
 (Source: Gendron and Smith 2013; and Raftovich and Wilkins 2013)

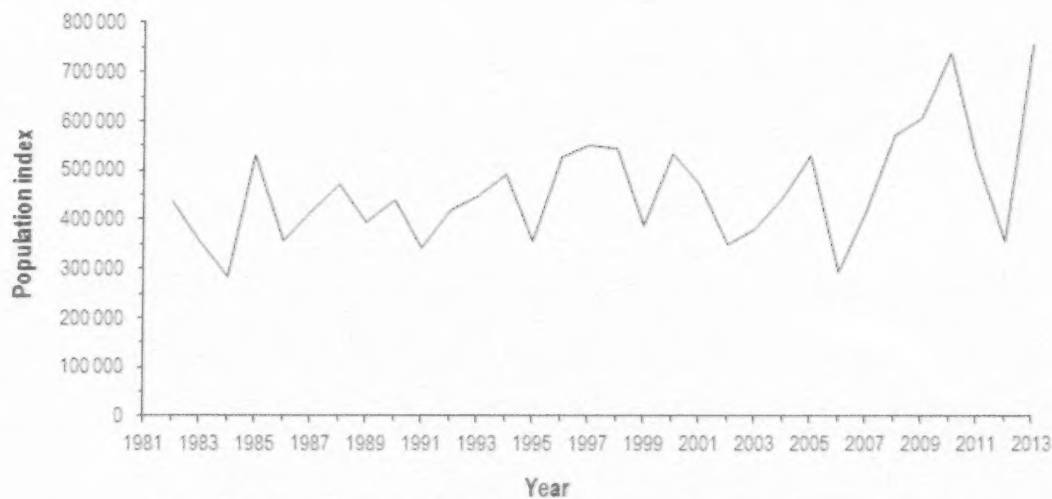


Figure 52. Mid-continent Population Sandhill Crane Spring Indices
 Note: the 2012 value is for the Central Platte River Valley only,
 and is uncorrected for visibility bias.
 (Source: Kruse et al. 2013)

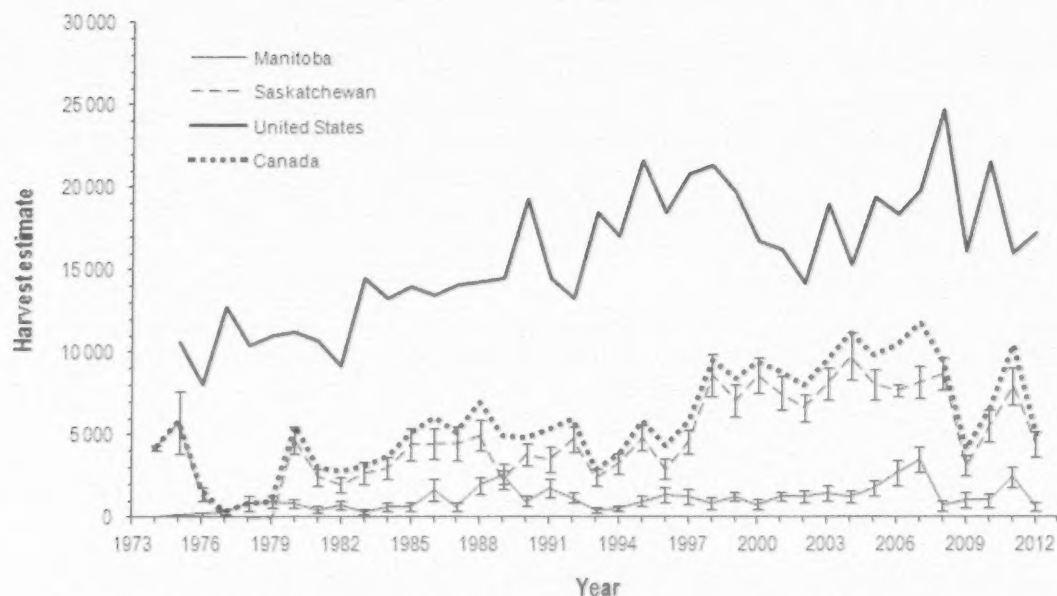


Figure 53. Harvest Estimates of Sandhill Cranes in Canada and the United States
Canadian harvest estimates ± 1 SE (Gendron and Smith 2013), and U.S. harvest estimates (Kruse et al. 2013). The USFWS results for years prior to 1999 are not directly comparable to those from 1999 onward.

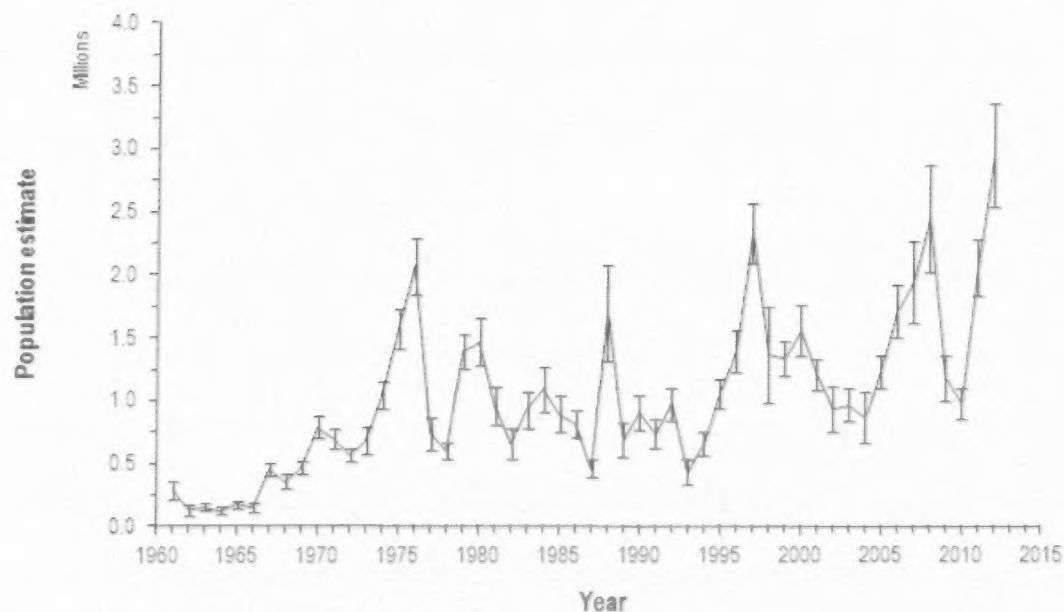


Figure 54. American Coot Breeding Population in the Canadian Prairies (± 1 SE) from the Waterfowl Breeding Population and Habitat Survey
(No data available in 2013)

APPENDIX C – TABLES

Table 1a. Trends in indicated breeding pairs of inland duck species in southern Ontario from 1971 to 2013. Data from breeding waterfowl surveys of ground and helicopter plots.

Species	Estimated Breeding Pairs		Recent	Long-term
	2012	2013	2003 - 2013	1971 - 2013
American Black Duck	7,314	3,641	-4.6%	-1.2%
Mallard	164,350	147,518	0.8%	1.1%
Wood Duck	88,153	60,158	9.0%	3.8%
Green-winged Teal	16,021	2,616	-6.5%	0.7%
Blue-winged Teal	690	2,044	-13.1%	-5.9%
Ring-necked Duck	30,584	25,114	4.3%	4.2%
Hooded Merganser	13,485	10,005	-0.6%	2.6%
Common Merganser	7,390	10,392	0.5%	4.5%
Canada Goose	74,286	86,488	1.9%	9.4%

Data source: CWS, Ontario Region

Note: Trends are expressed as an annual percentage change. Methods to test statistical significance of these trends have not yet been developed. No indication of significance can be given.

Table 1b. Abundance and trends in indicated breeding pairs of duck species in the St. Lawrence Lowlands, Québec (data from helicopter surveys)

Species	Abundance	Abundance	Trend	Trend
	2009–2013	2013	2004–2013	2009–2013
Mallard	14 569	18 803	2,3%	7,6%
American Black Duck	5 244	7 623	0,2%	0,0%
Green-winged Teal	3 656	2 947	3,3%	2,3%
Wood Duck	2 606	2 084	7,5%	-18,1%
Canada Goose	2 348	1 880	6,0%	-9,4%
Ring-necked Duck	948	1 372	6,0%	4,9%

Data source: CWS, Québec Region

Note: Trends are expressed as an annual percentage change. Methods to test statistical significance of these trends have not yet been developed. No indication of significance can be given.

Table 2. Harvest estimates of American Black Ducks in Canada and the United States

	Canada											United States ⁽¹⁾		Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total
1974	19 543	11 684	29 594	14 008	75 534	61 702	511						212 576	388 999
1975	35 354	14 620	59 467	21 876	90 593	85 070	262	118					307 360	357 197
1976	23 770	21 891	48 624	23 342	120 622	96 761	180	586	143	64			335 983	426 137
1977	38 835	18 044	46 186	20 568	129 618	82 886	727	547		48			337 459	274 049
1978	49 008	19 660	47 874	34 598	130 379	89 818	379			66			371 782	336 800
1979	44 658	12 732	33 687	24 339	112 926	87 557	242	363	256	266			317 026	299 300
1980	32 316	21 568	67 341	28 094	120 602	91 503	2 171	268					363 863	397 051
1981	38 047	16 133	58 692	26 460	105 733	76 298	337	213		41			321 954	290 405
1982	26 961	25 771	47 447	32 130	117 514	86 650	161	426					337 060	235 100
1983	32 956	25 049	57 725	31 007	101 637	60 454	259						309 087	198 217
1984	26 119	23 256	51 880	33 283	106 868	64 272	327		518				306 523	201 700
1985	28 556	18 535	44 397	32 261	110 998	64 692	427	135					300 001	189 980
1986	27 278	18 650	46 612	27 896	114 493	60 461	367	260	151				296 168	178 542
1987	20 184	18 114	39 138	27 218	129 612	61 176							295 442	172 212
1988	20 137	20 364	44 311	30 193	127 134	58 840		151	92				301 222	154 112
1989	29 299	11 548	47 322	25 582	99 675	47 518	144						261 088	193 726
1990	22 663	11 369	38 012	26 743	105 277	38 357	106	621	286	103			243 537	143 322
1991	15 073	14 499	39 295	20 122	85 220	48 670	1 189	312	1 329	229			225 938	167 520
1992	13 487	8 043	41 079	23 090	82 134	38 228	138	239	73				206 511	135 706
1993	13 133	10 741	36 298	19 591	87 869	34 556	1 125						203 313	146 666
1994	16 507	10 221	32 670	23 389	67 440	24 774	254	169				35	175 459	130 466
1995	15 461	13 355	40 546	29 332	54 776	33 470		204		17			187 161	168 800
1996	19 447	9 469	39 759	20 418	49 219	25 289							163 601	118 500
1997	18 816	12 982	32 666	17 966	56 103	26 309	265	147	215				165 469	151 779
1998	22 410	6 789	33 852	22 802	49 065	23 091	165		81	124			158 379	175 936
1999 ²	19 058	10 782	44 658	22 445	51 385	26 579	36						174 943	153 600
2000	21 605	6 980	43 922	18 083	43 476	19 995	204	653					154 918	179 500
2001	16 800	9 465	26 729	12 879	38 717	19 185	293						124 068	125 195
2002	18 021	6 214	28 310	14 449	36 346	19 130		76	89				122 635	176 538
2003	10 174	7 228	26 010	15 219	35 077	15 176		334					109 218	129 213
2004	12 888	4 827	16 969	9 775	30 588	16 710							91 757	111 955
2005	9 333	4 560	16 717	9 031	34 472	15 276	191						89 580	129 886
2006	16 529	5 168	20 630	11 159	33 900	16 644							104 030	129 196
2007	20 485	7 054	24 180	10 391	27 596	13 462	140	503					103 811	137 397
2008	22 067	5 829	22 764	12 285	29 154	11 094	160	184					103 537	120 150
2009	13 583	5 049	18 788	9 719	29 150	14 173	155						90 617	111 880
2010	8 908	7 660	12 913	12 131	31 408	14 096	90			52			87 258	119 617
2011	8 919	5 866	22 236	9 237	31 678	13 926							91 862	88 351
2012	20 213	8 795	24 622	13 260	24 594	11 878							103 362	94 559

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway.²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and R.V. Raftovich and Wilkins 2013 (USFWS, US data).

Table 3. Estimates of trends in numbers of May ponds and Duck breeding populations in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey.

Species	Time Period	Region				Entire Survey Area
		Alaska	Western Boreal Canada	Canadian Prairies	U.S. Prairies	
		(11 strata)	(17 strata)	(15 strata)	(9 strata)	(52 strata)
May ponds ¹	1974-2013	N/A	N/A	0.3 (15)	1.7 * (9)	N/A
	2004-2013	N/A	N/A	3.1 * (15)	6.8 * (9)	N/A
	2009-2013	N/A	N/A	5.4 (15)	-9.3 (9)	N/A
Total ducks ²	1961-2013	1.3 * (11)	-0.2 (17)	0.1 (15)	2.0 * (9)	0.5 * (52)
	2004-2013	-4.8 * (11)	2.6 (17)	3.8 * (15)	10.9 * (9)	3.9 * (52)
	2009-2013	-8.7 * (11)	-0.9 (17)	12.4 * (15)	-2.6 (9)	1.6 (52)
Mallard	1961-2013	2.7 * (11)	-0.2 (17)	-0.3 (15)	2.3 * (9)	0.4 (52)
	2004-2013	-6.6 * (11)	5.0 * (17)	4.1 * (15)	7.8 * (9)	4.6 * (52)
	2009-2013	-9.0 * (11)	5.4 (17)	11.4 * (15)	4.2 (9)	6.4 * (52)
Gadwall	1961-2013	6.3 (9)	2.2 (17)	1.5 * (15)	3.5 * (9)	2.3 * (50)
	2004-2013	-8.3 (9)	-10.1 * (17)	2.5 (15)	6.8 * (9)	3.7 * (50)
	2009-2013	-	-6.5 (17)	4.6 (15)	3.4 (9)	3.2 (50)
American Wigeon	1961-2013	3.8 * (11)	-0.8 * (17)	-2.1 * (15)	1.3 (9)	-0.2 (52)
	2004-2013	-4.5 * (11)	3.3 * (17)	3.9 * (15)	4.4 (9)	1.1 (52)
	2009-2013	-9.4 * (11)	7.1 (17)	13.0 * (15)	-20.8 * (9)	0.2 (52)
Green-winged Teal	1961-2013	4.3 * (11)	1.2 * (17)	1.0 (15)	2.4 * (9)	1.6 * (52)
	2004-2013	-3.6 * (11)	6.6 (17)	8.8 * (15)	4.6 (9)	4.0 * (52)
	2009-2013	-10.1 (11)	0.3 (17)	3.9 (15)	-17.5 (9)	-2.6 (52)
Blue-winged Teal	1961-2013	4.4 (8)	-0.8 (16)	0.9 (15)	2.0 * (9)	1.2 * (48)
	2004-2013	-57.4 (8)	-5.9 * (16)	4.2 (15)	13.7 * (9)	7.9 * (48)
	2009-2013	-	-0.5 (16)	16.0 * (15)	-2.5 (9)	4.3 (48)
Northern Shoveler	1961-2013	6.9 * (11)	0.8 (17)	1.7 * (15)	2.2 * (9)	2.0 * (52)
	2004-2013	-8.5 * (11)	0.8 (17)	4.1 * (15)	14.7 * (9)	4.9 * (52)
	2009-2013	-17.7 * (11)	3.1 (17)	20.6 * (15)	-8.8 * (9)	3.5 (52)
Northern Pintail	1961-2013	0.6 (11)	-1.8 * (17)	-2.4 * (15)	-0.6 (9)	-1.2 * (52)
	2004-2013	0.4 (11)	0.1 (17)	1.1 (15)	17.3 * (9)	4.7 * (52)
	2009-2013	1.8 (11)	-13.0 (17)	19.0 * (15)	-10.0 (9)	0.6 (52)
Redhead	1961-2013	-2.1 (10)	-0.3 (17)	1.3 * (15)	1.7 * (9)	1.3 * (51)
	2004-2013	-51.4 * (10)	-12.6 * (17)	5.8 * (15)	19.8 * (9)	8.6 * (51)
	2009-2013	-	-8.4 (17)	10.6 * (15)	0.9 (9)	4.6 (51)
Canvasback	1961-2013	0.2 (11)	0.3 (17)	0.5 (15)	2.2 * (9)	0.6 * (52)
	2004-2013	-16.7 (11)	-4.3 (17)	6.0 * (15)	15.9 * (9)	2.3 (52)
	2009-2013	-9.3 (11)	0.3 (17)	12.6 * (15)	-1.0 (9)	5.7 * (52)
Scaup spp.	1961-2013	0.0 (11)	-1.4 * (17)	-0.9 (15)	2.5 (9)	-0.9 * (52)
	2004-2013	-5.2 * (11)	6.5 * (17)	5.4 * (15)	6.3 (9)	3.7 * (52)
	2009-2013	-9.0 * (11)	4.1 (17)	7.5 (15)	0.0 (9)	2.0 (52)
Ring-necked Duck	1961-2013	44.3 * (11)	2.3 * (17)	2.6 * (15)	8.6 (9)	2.5 * (52)
	2004-2013	-12.0 * (11)	0.1 (17)	11.3 * (15)	24.6 * (9)	1.2 (52)
	2009-2013	-3.5 (11)	-3.3 (17)	26.7 * (15)	2.9 (9)	-0.5 (52)
Ruddy Duck ³	1961-2013	-	- (16)	- (15)	- (9)	- (44)
	2004-2013	-	- (16)	- (15)	- (9)	- (44)
	2009-2013	-	- (16)	- (15)	- (9)	- (44)

Trends were calculated using the estimating equations technique (Link and Sauer 1994) and are expressed as an annual percentage change. The number of strata is given in parentheses (a minimum of 5 strata was deemed necessary to perform a trend analysis).

* Trend significant at $p < 0.05$

¹Adjusted May pond estimates for the U.S. Prairies are only available since 1974; pond estimates from strata 75 and 76 (Western Boreal Canada) which are counted since 1989 were excluded from the analysis.

²Total ducks include all species of ducks observed during the survey, including sea ducks.

³No data available for 2013.

Table 3 cont'd. Estimates of trends in numbers of May ponds and Duck breeding populations in the traditional survey area of the Waterfowl Breeding Population and Habitat Survey.

Species	Time Period	Region				Entire Survey Area
		Alaska	Western Boreal Canada	Canadian Prairies	U.S. Prairies	
		(11 strata)	(17 strata)	(15 strata)	(9 strata)	
Mergansers ³	1961-2013	- (11)	- (17)	- (15)	- (9)	- (52)
	2004-2013	- (11)	- (17)	- (15)	- (9)	- (52)
	2009-2013	- (11)	- (17)	- (15)	- (9)	- (52)
Goldeneyes	1961-2013	-0.6 (11)	3.2 (17)	3.1 * (15)	-2.5 (8)	1.3 * (51)
	2004-2013	-8.8 * (11)	5.2 (17)	1.9 (15)		3.4 (51)
	2009-2013	1.4 (11)	3.2 (17)	8.1 (15)		3.9 (51)
Bufflehead	1961-2013	0.3 * (11)	1.8 * (17)	3.2 * (15)	6.4 * (9)	1.9 * (52)
	2004-2013	0.0 (11)	1.2 (17)	6.2 (15)	21.7 (9)	2.1 (52)
	2009-2013	-6.4 (11)	-2.1 (17)	15.0 * (15)	25.9 (9)	0.4 (52)
Long-tailed Duck ³	1961-2013	4.8 * (11)	- (15)	- (7)		- (34)
	2004-2013	58.2 * (11)	- (15)			- (34)
	2009-2013	-95.6 * (11)	- (15)			- (34)
Scoter spp. ³	1961-2013	-4.0 * (11)	- (17)	- (12)		- (44)
	2004-2013	-62.2 * (11)	- (17)	- (12)		- (44)
	2009-2013	-96.7 * (11)	- (17)	- (12)		- (44)

Trends were calculated using the estimating equations technique (Link and Sauer 1994) and are expressed as an annual percentage change. The number of strata is given in parentheses (a minimum of 5 strata was deemed necessary to perform a trend analysis).

* Trend significant at $p < 0.05$

¹Adjusted May pond estimates for the U.S. Prairies are only available since 1974; pond estimates from strata 75 and 76 (Western Boreal Canada) which are counted since 1989 were excluded from the analysis.

²Total ducks include all species of ducks observed during the survey, including sea ducks.

³No data available for 2013.

Table 4. Harvest estimates of Mallards in Canada and the United States

	Canada													United States ¹	Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total	Total
1974	154	130	406	761	50 036	191 532	105 723	366 291	488 448	62 595			1266 076	4 604 760	5 870 836
1975	774	405	972	583	57 791	296 173	159 142	567 985	521 935	122 725	1 698	797	1730 980	5 021 187	6 752 167
1976	770	256	753	748	71 851	322 047	204 598	606 239	609 576	114 198	3 229	898	1935 163	5 089 879	7 025 042
1977	836	196	1 155	992	81 835	268 878	165 257	391 986	510 396	131 066	3 073	584	1556 254	4 436 025	5 992 279
1978	850	259	2 659	452	61 507	322 006	239 298	395 276	382 319	115 038	2 098	1 290	1523 052	5 024 806	6 547 858
1979	555	465	3 077	725	70 597	266 018	245 016	419 509	485 014	117 176	1 182	1 673	1611 007	4 772 481	6 383 488
1980		948	3 056	1 436	82 027	290 941	210 152	355 042	480 188	104 768	2 551	2 473	1533 582	4 650 996	6 184 578
1981	2 945	1 461	2 536	2 491	91 946	279 541	175 213	231 119	392 273	114 672	1 703	1 033	1296 933	4 342 590	5 639 523
1982	438	410	1 406	1 792	93 288	335 813	148 862	241 734	296 124	92 492	1 552		1213 911	3 907 640	5 121 551
1983	1 067	937	4 044	2 557	87 349	297 944	160 521	284 403	364 000	121 758	2 417	603	1327 600	4 419 401	5 747 001
1984	1 097	738	2 120	1 668	67 432	284 128	117 207	183 300	306 234	89 453	4 501	1 366	1059 244	3 924 516	4 983 760
1985	794	1 149	3 310	3 258	97 037	293 333	87 172	158 302	180 117	81 943	4 153	914	911 482	3 321 432	4 232 914
1986	2 933	755	3 135	2 526	84 303	265 491	112 363	151 384	182 748	72 263	811	433	879 145	3 370 312	4 249 457
1987	1 020	728	3 692	3 141	116 452	315 101	136 678	154 961	211 929	75 591	1 120	192	1020 605	3 204 515	4 225 120
1988		902	2 304	1 620	83 748	233 556	64 324	75 853	139 565	63 700	2 543	412	668 527	1 989 367	2 657 894
1989	1 280	925	4 339	2 246	79 419	263 152	70 132	75 645	188 516	57 269	438	773	744 134	2 333 286	3 077 420
1990	1 162	1 028	3 557	3 183	86 524	261 267	60 851	79 494	175 921	60 395	866	290	734 538	2 287 525	3 022 063
1991	949	1 106	3 712	4 582	84 483	229 026	60 932	70 050	122 105	51 458	94	641	629 138	2 354 562	2 983 700
1992	863	199	6 407	5 243	87 824	196 647	65 991	68 765	94 795	52 172	605	298	579 809	2 538 227	3 118 036
1993	1 025	1 178	5 029	3 755	100 032	202 647	42 969	50 351	83 094	45 181	1 178	560	536 999	2 736 658	3 273 657
1994	795	864	3 305	2 894	107 222	197 833	57 923	88 848	113 068	50 412	2 042	205	625 411	3 108 589	3 734 000
1995	532	751	4 822	5 131	83 307	176 680	74 206	104 296	111 048	40 782	1 509	278	603 342	4 405 867	5 009 209
1996	351	1 024	4 286	4 044	82 201	176 869	91 265	121 608	115 668	42 447	1 326		641 089	4 851 606	5 492 695
1997	1 461	417	8 047	5 371	77 594	178 169	107 379	133 017	151 167	55 513	437	126	718 698	5 378 576	6 097 274
1998	1 628	1 011	5 440	7 512	76 320	164 431	104 469	129 461	119 826	52 663	881	276	663 918	5 589 746	6 253 664
1999 ²	1 188	667	6 305	4 866	69 568	131 901	82 637	182 714	105 126	48 002		220	633 194	5 499 044	6 132 238
2000	1 511	1 915	5 481	5 999	81 655	162 352	78 201	195 276	107 203	49 272	510	72	689 447	5 677 925	6 367 372
2001	600	1 192	5 720	7 046	79 895	166 628	92 114	107 411	94 698	35 574	642	229	591 749	5 383 678	5 975 427
2002	299	2 175	6 498	6 001	66 532	147 844	77 991	118 856	80 706	37 370	1 701	609	546 582	4 915 597	5 462 179
2003	694	803	4 711	6 509	58 871	138 096	66 402	126 396	73 086	35 383	409	109	511 469	5 019 204	5 530 673
2004	1 985	1 100	5 245	5 227	65 284	132 186	75 968	129 627	78 269	28 515	275	36	523 717	4 527 295	5 051 012
2005	754	1 681	4 544	4 732	72 231	115 284	87 315	144 393	78 798	33 586	688		544 006	4 436 639	4 980 645
2006	753	1 122	5 460	6 389	72 245	124 751	111 026	174 174	88 533	28 928	215		613 626	4 668 411	5 282 037
2007	1 837	1 289	5 711	7 030	65 187	119 403	68 121	163 912	82 133	30 167	897	265	545 952	4 858 382	5 404 334
2008	48	1 725	4 748	5 662	69 899	119 971	60 690	150 906	97 567	35 924		488	547 628	4 554 968	5 102 596
2009	80	651	4 079	3 377	65 216	106 537	61 460	135 546	62 778	32 736		67	472 527	4 114 119	4 586 646
2010	1 319	2 197	4 057	4 683	57 138	105 904	48 076	127 207	67 681	28 057			446 319	4 166 253	4 612 572
2011	670	3 434	5 296	5 501	62 037	105 529	59 170	143 258	91 670	32 990	334		509 889	4 409 096	4 918 985
2012	767	1 475	3 060	5 682	55 862	79 180	67 173	188 383	89 249	36 160	415	928	528 334	3 935 272	4 463 606

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska)²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and R.V. Raftovich and Wilkins 2013 (USFWS, US data)

Table 5. Harvest estimates of Northern Pintails in Canada and the United

	Canada												U.S.A. ¹	Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total
1974	939	820	659	790	14 043	8 296	7 545	39 226	69 214	14 281			155 813	1 248 305
1975	1 092	431	612	787	21 999	9 644	20 611	55 909	81 637	23 758	72	417	216 969	1 566 686
1976	1 507	651	2 663	352	27 578	17 112	17 545	34 693	59 532	38 626	385	277	200 921	1 322 166
1977	2 438	1 653	1 717	607	39 581	14 333	11 243	20 469	69 905	29 464	137	313	191 860	985 055
1978	824	829	1 892	1 039	21 298	13 077	21 072	14 051	38 039	22 830	698	216	135 865	1 337 507
1979	1 693	579	1 056	382	14 958	9 326	19 745	30 588	48 505	17 735	691	287	145 545	1 320 392
1980	905	510	757	1 384	16 722	13 248	12 872	16 868	44 003	21 392		108	128 769	1 080 571
1981	1 536	747	951	1 144	17 437	11 977	16 099	2 430	39 745	18 658	91	148	110 963	790 803
1982		1 531	1 009	1 479	20 791	10 946	13 290	12 598	29 130	14 021			104 795	791 353
1983	2 805	523	694	303	15 867	10 767	11 195	17 056	27 154	13 385	1 864	175	101 788	809 817
1984	1 698	1 047	717	908	9 253	10 132	13 131	12 343	34 016	19 661	168	337	103 411	666 255
1985	1 459	748	1 460	1 817	16 486	15 345	9 668	8 117	24 051	11 244		810	91 205	523 330
1986	634	565	846	1 841	13 163	9 057	6 988	9 077	8 632	8 885		296	59 984	456 235
1987	807	2 218	632	1 017	11 864	6 020	5 478	8 386	19 668	10 945		158	67 193	537 942
1988	1 998	1 449	486	715	12 160	8 019	13 779	5 320	14 667	10 831			69 424	199 100
1989	1 421	660	344	1 406	15 460	11 511	7 560	4 326	11 766	8 549	45		63 048	262 712
1990	4 114	450	653	1 707	19 568	8 231	5 279	10 087	13 483	7 750	281	41	71 644	236 271
1991	351	542	901	844	9 357	4 742	4 407	4 023	5 689	4 179	112	73	35 220	209 701
1992		910	79	464	6 221	4 861	5 236	2 126	6 914	6 393	136	77	33 417	216 158
1993	1 090	1 336	852	706	11 401	5 156	5 172	3 253	4 025	4 701	61		37 753	248 406
1994	934	765	1 163	1 136	11 307	4 649	4 866	7 302	7 518	4 738		64	44 442	310 549
1995	1 727	454	965	1 240	7 831	4 552	8 974	6 521	7 573	4 476			44 313	522 602
1996	1 246	478	897	1 234	5 043	4 011	10 323	14 477	9 621	5 367			52 697	520 170
1997	785	139	116	493	7 423	5 560	13 248	13 656	13 883	5 422	37		60 762	695 410
1998	1 026		653	757	7 735	6 361	14 347	11 099	11 119	6 462	19	276	59 854	572 168
1999 ²	390	1 137	755	1 790	8 956	6 457	9 830	10 610	10 304	5 464		0	55 693	539 520
2000	470	509	499	581	6 480	5 397	8 766	16 168	13 603	5 825	50		58 348	511 249
2001	137		400	610	4 910	3 708	9 215	7 050	8 730	4 806	18	59	39 643	434 952
2002	1 153	77	542	702	5 526	9 908	13 878	13 053	7 640	4 549			57 028	323 409
2003	571	598	227	1 270	6 794	10 420	8 998	8 687	8 204	1 947	234		47 950	341 113
2004	30	316	129	701	6 393	5 207	12 623	23 801	8 379	2 361			59 940	306 032
2005	256	313	308	536	4 677	3 178	6 653	13 450	10 769	3 675			43 815	406 262
2006	176	939	90	382	5 067	4 861	8 579	11 853	12 527	2 004	39		46 517	430 341
2007	228	584	660	634	5 533	5 059	13 329	18 054	10 085	2 410	224		56 800	521 998
2008	427	252	393	427	4 887	5 745	7 911	15 076	12 833	2 989			50 940	536 519
2009		190	104	504	4 039	4 684	4 582	17 226	6 138	2 837		2	40 306	498 762
2010	321	943	824	609	6 266	6 480	4 862	13 530	6 728	2 228			42 791	694 530
2011	302		578	263	3 287	1 670	6 188	20 217	14 053	2 755			49 313	809 973
2012		435	62		2 216	2 364	2 519	15 474	14 307	4 464			41 841	683 446

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska).

²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and R. V. Raftovich and Wilkins 2013 (USFWS, US data)

Table 6. Harvest estimates of Lesser Scaup in Canada and the United States

	Canada												U.S. ¹	Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total
1974	3 601	37	688	731	22 326	43 359	16 244	10 698	9 432	1 612			108 728	449 130
1975	6 323	166	1 450	943	28 681	43 739	21 748	10 861	18 870	2 661	369	661	136 472	356 790
1976	656	89	1 139	238	34 714	50 152	27 108	16 747	14 470	2 243	169	386	148 111	531 104
1977	1 033	61	3 552	146	31 895	46 505	11 010	7 250	8 363	3 474	799	237	114 325	684 536
1978	1 666	43	1 857		23 451	26 854	14 537	10 400	13 551	3 114	215	341	96 029	314 815
1979	241		751	51	26 706	35 097	15 433	7 646	10 827	1 799	571		99 122	251 479
1980	2 844	73	662	746	28 850	55 807	27 541	4 910	13 112	1 906	599		137 050	235 976
1981	1 607		704	735	31 991	58 463	18 807	3 225	8 980	1 224	507	148	126 391	547 907
1982	126		387	309	20 981	37 287	27 394	6 655	13 226	1 721			108 086	356 873
1983	471	104	550	575	19 171	42 320	22 289	9 122	6 551	103		78	101 334	268 846
1984	1 695	31	352	912	17 696	53 451	18 336	10 861	5 435	975	98	74	109 916	661 695
1985	874		365	951	25 866	61 409	15 356	2 498	6 604	1 240	831		115 994	486 452
1986	1 839		430	1 646	23 080	47 546	14 674	5 382	5 974	1 191	170		101 932	248 061
1987	339	290	615	541	11 981	34 512	10 400	7 129	5 458	1 140		12	72 417	185 241
1988		87	943	544	22 429	32 983	6 885	5 019	3 341	496	424		73 151	148 620
1989	2 063	52	1 237	1 119	26 710	42 316	7 296	1 347	3 073	608	179		86 000	126 833
1990	1 757	35	1 051	1 696	24 047	25 772	6 592	2 557	3 888	778	191		68 364	102 227
1991	272		481	455	18 402	31 204	9 226	3 864	2 464	428	37		66 833	150 188
1992	1 004		171	116	15 249	24 577	8 227	778	2 320	650	33		53 135	187 098
1993	2 231		401	690	20 912	35 171	6 228	2 196	1 628	452	35	40	69 986	106 264
1994	510	99	445	244	11 479	27 137	12 344	2 742	3 247	378		52	58 677	176 974
1995			334	730	8 705	27 465	14 185	2 263	2 926	242			56 850	285 420
1996	178		331	156	7 460	17 344	9 258	2 415	2 800	1 162	331		41 435	459 787
1997	232		512	782	6 529	19 843	5 185	4 262	4 863	1 302	431		43 941	510 170
1998	1 455		223	1 300	11 513	16 069	5 400	6 287	2 695	311			45 253	560 179
1999 ²	470		131	110	8 339	19 599	10 233	2 143	939	181			42 145	210 149
2000	26			49	5 071	9 781	11 987	1 284	1 768	178	74	130	30 348	349 943
2001	414		60	138	5 082	13 530	8 117	1 777	861	119	128	8	30 234	364 135
2002	1 436	548	412	843	5 576	14 259	6 007	1 524	1 791	383		174	32 953	390 447
2003	682	183	433	265	8 602	11 995	2 376	3 980	2 311	175	117		31 119	298 596
2004	814		27	186	3 619	9 859	7 362	921	1 593	291			24 672	292 883
2005	381	304	189	266	3 459	10 088	4 683	2 520	1 777	120			23 787	257 564
2006	250		172	436	7 219	16 425	4 459	865	2 058	46	97		32 027	232 959
2007	146	47	341	209	1 953	10 813	10 291	907	5 852		224		30 783	224 053
2008	215	33	90	118	3 374	14 647	12 087		7 259	281			38 109	179 561
2009		48	247	343	2 710	7 063	8 238	826	7 700	202		22	27 399	222 067
2010	970		364	747	2 830	11 364	10 250	4 192	3 986	505			35 208	287 907
2011		209		186	2 987	7 722	5 553	2 029	2 162	218			21 066	227 426
2012		890	227	191	2 991	9 672	7 775	1 414	5 804	150	775		29 889	634 280

¹ AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska).

² The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and R. V. Raftovich and Wilkins 2013 (USFWS, US data)

Table 7. Harvest estimates of Greater Scaup in Canada and the United States

	Canada												U.S. ¹	Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total
1974	1788	314	1620	488	20243	18172	572	532		1039			44768	77064
1975	1321		2401	283	25353	36056	1136	176	1215	2986	69		70996	65390
1976	3095		3522	478	28190	37526	1140	291		1297			75539	97062
1977	2436	217	1895	244	21126	44900				617		64	71499	114931
1978	1611		502	141	17811	20465	1782			320		77	42709	101662
1979	637		959	97	20315	26367	677			1391			50443	49750
1980	3052	147	738	384	18922	29535	720			739			54237	48739
1981	344		170	818	22891	23762	1139			548			49672	86283
1982	1476	63	411	584	15678	15797				230			34239	90892
1983	427		1289	574	13443	38628				924			55285	67843
1984	2565	31	1098	1125	18999	22538	419	561	133	907			48376	67232
1985	2423	428	759	272	17880	28128	1022			134		63	51109	60013
1986	5095	404	2213	1456	11638	30320	970	214	151	1112			53573	55163
1987	1103		672	1323	6941	13103	746	131		318			24337	39712
1988	920		3221	585	13622	13859				212			32419	26202
1989	5264	51	2547	1498	9380	14701			182	242			33865	25082
1990	3684	79	1609	420	9284	11959	383		195	81			27694	26606
1991			1657	267	6314	9815	626	474	387	153			19693	18877
1992	1360		805	898	4830	9913	298			87			18191	19365
1993	5959	176	1161	362	8589	8651	163				21		25082	27152
1994	706		1501	307	6550	8329	306			26			17725	29259
1995	508	82	920	542	5080	12861	268			97			20358	53018
1996	596	65	772	914	5839	7653	286		297				16422	49734
1997	677	83	919	1119	3627	6002	157			379			12963	62883
1998	1703	169	256	1878	4055	4274	165		162				12662	45712
1999 ²	1377		332	55	4171	4671	929					3	11538	35336
2000	1075		1157	659	2961	3190	120						9162	42453
2001	1210		234	1492	1537	4276	747			18			9514	32702
2002	1125	77	437	1517	2725	4816	690				151		11538	72258
2003	576	366	524	337	2100	5481			173				9557	49192
2004	964	39	90	503	3040	7029	285		161	26			12137	71127
2005	447		193	536	1562	2840	235						5813	57212
2006	705	287	191	430	4002	3010					19		8644	47780
2007	619	101	91	165	815	6764	88			29			8672	70833
2008		41	414	243	1445	5876	343		140	35			8537	49465
2009			223	155	912	3244	540					22	5096	55139
2010	442			2624	939	2835	46						6886	69814
2011					1915	3617							5532	59424
2012	224			197	1758	4022			186				6387	77512

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska)

²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and R.V. Raftovich and Wilkins 2013

Table 8. Harvest estimates of Canvasbacks in Canada and the United States.

	Canada													U.S. ¹		Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total	Total	
1974					1461	7530	3904	5647	3344	773			22659	74949	97608	
1975					2116	18757	8205	9065	4262	1051		17	43473	93761	137234	
1976				20	2117	17817	5321	7454	3773	1360			37862	127001	164863	
1977					1036	6162	2770	4019	2076	198		44	16305	75117	91422	
1978					3293	11996	4596	4544	2424	233			27086	64092	91178	
1979					3769	14208	7922	7585	2239				35723	91847	127570	
1980					3301	10966	4746	1420	5431	1269			27133	66329	93462	
1981					625	8327	3883	1066	5193	534			19628	58030	77658	
1982					1440	6223	7669	3236	344				18912	45050	63962	
1983					400	10970	6696	2638	4040	240			24984	81108	106092	
1984					214	8279	1819	4716	3620	210		37	18895	71263	90158	
1985					1435	8673	3349	3617	1427	201			18702	79926	98628	
1986	216		461		1082	14385	3145	5242	3951	956	53		29491	23983	53474	
1987					503	6158	2945	638	709	463			11416	19397	30813	
1988					504	2153	2744	1491	385	230			7507	826	8333	
1989						3636	1255	219	869	45	45		6069	10882	16951	
1990						5902	1392	508	697		23		8522	7903	16425	
1991					198	4206	473	2473	1855	98			9303	7723	17026	
1992					134	3194	788	282	194	35			4627	11581	16208	
1993					88	1602	2505	1862	570	25			6652	13222	19874	
1994						1331	3695	1141	1843	164			8174	69386	77560	
1995						5444	4016	1303	1542	119			12424	108231	120655	
1996				74	4219	2965	3914	1385					12557	109217	121774	
1997						7585	5802	1708	1387	55			16537	120636	137173	
1998						5266	2012	392	663	83	233		8649	93048	101697	
1999 ²						2133	5065		787	51			8036	88171	96207	
2000				111	3085	4022	588	1095	0	12			8913	103655	112568	
2001						896	4223	411	464	136			6130	36225	42355	
2002						951	3195	756	253	95			5250	2709	7959	
2003						971	5962	1325	954	55			9267	35384	44651	
2004				57	1837	2026	428	145					4493	44398	48891	
2005						971	7563	3716	825	82			13157	64068	77225	
2006						3173	4131	2633	320	15	19		10291	91886	102177	
2007						1812	2344	4905	3334	26			12421	125207	137628	
2008						1018	3667	2310	2265	35			9295	18173	27468	
2009						958	7897	456	797				10108	70393	80501	
2010					121	1972	2095	518	1120	59			5885	145686	151571	
2011					90	3913	2051	6150	794				12998	140862	153860	
2012						504	2041	1693	1346				5584	117249	122833	

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska).

²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and R.V. Rafterovich and Wilkins 2013 (USFWS, US data)

Table 9. Black Scoters harvest estimates in Canada and the United States

	Canada											USA ¹		Continental	
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	YT/NU	YT	Total	Total	Total
1974	2 239		1 300	17	5 555	3 646							12 757	24 318	37075
1975	126		2 788		11 105	11 628					23		25 670	19 033	44703
1976	2 711		5 231	245	17 217	6 853							32 257	11 502	43759
1977	5 210	94	3 547	40	25 536	3 671				90	198		38 386	19 943	58329
1978	365		2 106		6 351	1 999				92			10 913	8 142	1905
1979	1 830		3 078	43	11 455	1 973					85	107	18 571	12 964	31535
1980	1 195		1 104		12 065	912							15 276	7 830	23106
1981	3 406		5 231	165	11 438	2 883				55			23 178	12 243	35421
1982	6 158		2 769		6 574	967							16 468	5 523	21991
1983	880		2 308	49	5 390	2 303				37			10 967	4 334	15301
1984	2 024		1 536		7 756	2 074	330			57			13 777	11 649	25426
1985	884	209	1 094		7 005	3 502							12 694	15 875	28569
1986	579		3 127		2 314	2 795						34	8 849	7 212	16061
1987	572		1 359	678	7 195	843	414						11 061	10 128	21189
1988	147		1 124	441	3 430	714							5 856	5 698	11554
1989	463		650		5 006	705							6 824	6 815	13639
1990	377		1 114	202	3 856	1 455							7 004	12 183	19187
1991	783		2 330	94	3 253	907							7 367	6 600	13967
1992	969		1 769		1 477	669						24	4 908	4 915	9823
1993	570		1 166		4 882	656	618						7 892	3 724	11616
1994	298		3 216	54	2 297	549	971			29	165		7 579	6 952	14531
1995	1 543		1 978	149	679	563							4 912	3 100	8012
1996	568		1 000	32	1 598	378							3 576	5 677	9253
1997			1 324	43	2 202	205							3 774	5 668	9442
1998	1 212	14	985	51	2 752	186							5 200	3 888	9088
1999 ²	524		1 002		1 620	464							3 610	9 600	13210
2000	29		1 354	677	497	260							2 817	6 300	9117
2001	928		2 646		947	682							5 203	6 600	11803
2002	838	158	1 462	72	610	243							3 383	11 600	14983
2003	536		821	74	655	221							2 307	20 400	22707
2004			1 737	36	790	96							2 659	13 800	16469
2005	754		1 580		239								2 573	20 530	23103
2006	250		740		1 215	288							2 493	9 643	12136
2007			277		393	227							897	9 122	10019
2008			823		1 723	126							2 672	6 249	8921
2009			728	81	81	126							1 016	9 613	10629
2010	228		2 421	182	1 797								4 628	15 513	20141
2011			575		1 814								2 389	14 631	17020
2012	58		197	314	2 543	202							3 314	12 042	15356

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska)

²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and S. M. Olson and R. E. Trost 2013 (USFWS, US data)

Table 10. White-winged Scoters harvest estimates in Canada and the United States

	Canada													U. S. ¹		Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total	Total	
1974		113	1 105	46	9 676	4 611	291		251	174			16 267	33 517	49 784	
1975			1 742	233	4 934	4 277	141		357	143		54	11 881	35 186	47 067	
1976	95	204	2 792	193	8 245	4 122	396		648	61		164	16 920	20 172	37 092	
1977			2 253		10 277	4 393	183		118	57		247	17 528	16 329	33 857	
1978	1 105	153	417	283	5 042	3 310		381	334	265			11 290	15 839	27 129	
1979	565		989	117	8 018	5 845		364	172				16 070	10 444	26 514	
1980	3 483		3 497	92	10 829	3 142				102			21 145	17 010	38 155	
1981	728		1 231	114	7 831	2 510				689	116		13 219	14 842	28 061	
1982	767		1 459	151	7 798	2 000			1 484	1 259			14 918	15 341	30 259	
1983	710		1 418	199	7 842	2 470		516		162			13 317	12 116	25 433	
1984	1 645	30	2 253		11 052	3 636					408		19 024	34 053	53 077	
1985	1 028		791	97	7 792	2 892	283		252	66	1 661		14 862	21 835	36 697	
1986	215		401	46	2 359	1 443		213		297			4 974	10 718	15 692	
1987			1 090	90	6 950	3 618			106	78			11 932	24 305	36 237	
1988	2 190		1 963	60	7 072	1 403				51			12 739	18 720	31 459	
1989	202		1 515	128	8 078	1 858							11 781	8 410	20 191	
1990	899		2 200	139	5 297	801	789						10 125	15 474	25 599	
1991			465	90	2 505	1 096							4 156	19 827	23 983	
1992	283		1 638		5 213	441							7 575	11 804	19 379	
1993	544	379	1 238	123	4 415	2 041	162				35		8 937	8 920	17 857	
1994	344		2 132		5 932	1 343							9 751	6 683	16 434	
1995			1 846		1 795	672							4 313	8 548	12 861	
1996	89		1 034		2 464	1 175							4 762	13 954	18 716	
1997	58		1 191		2 306	470							4 025	7 867	11 892	
1998	598		758	198	3 363	291							5 208	6 119	11 327	
1999 ²	41		412		1 337	260						3	2 053	3 500	5 553	
2000	47		313		527	104					24		1 015	6 200	7 215	
2001	72		227	199	1 021	379	159	157		26			2 240	23 200	25 440	
2002		158	680	52	1 179	282							2 351	9 100	11 451	
2003	409		636	43	789	97			173				2 147	11 100	13 247	
2004			156		1 238	137							1 531	11 100	12 631	
2005			151	34	908	78							1 171	6 547	7 718	
2006			407	42	1 202	404							2 055	12 287	14 342	
2007			130	85	281	334							830	8 009	8 839	
2008			480	31	949		64						1 524	7 632	9 156	
2009			506		1 048	126			226	19			1 925	8 742	10 667	
2010	1 652		1 436		988	318							4 394	6 797	11 191	
2011			1 075	56	1 381								2 512	11 034	13 546	
2012			350	50	803	168							1 371	4 562	5 933	

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska)

²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and S. M. Olson and R. E. Trost 2013 (USFWS, US data)

Table 11. Surf Scoters harvest estimates in Canada and the United States

	Canada												U.S. ¹	Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total
1974	1 074	34	2 714	243	9 757	2 645				322			16 789	27 386
1975		52	1 422	391	15 601	10 372	360	497		51			28 746	34 570
1976	4 357	714	7 220	1 168	20 035	8 684	566			77	69	41	42 931	18 167
1977	1 654	655	7 501	754	17 584	7 911							36 059	31 235
1978	671	54	1 279	640	8 842	3 118				207	45		14 856	17 054
1979	1 452		3 061	203	12 279	7 909							24 904	12 804
1980	1 569		4 190	655	10 321	5 162	89			103	634		22 723	11 931
1981	1 246		6 390	191	12 827	1 532	495			293	94		23 068	25 120
1982	9 936		2 776	355	14 879	1 285	260			171			29 662	8 020
1983	4 748		1 079		4 118	871	351		189	74	148		11 578	8 067
1984	4 145		2 957	152	7 942	3 063	284			307	112		18 962	27 372
1985	1 377		3 678	148	6 399	593	283			66	830		13 374	21 076
1986	2 338	82	2 456	186	2 060	1 994				29	124	34	9 303	20 583
1987	570		3 031	194	6 888	2 048		130		264			13 125	20 419
1988	987		2 397	282	7 331	634							11 631	8 714
1989	2 626		4 803		5 070	2 896				39			15 434	17 772
1990	3 410		7 552	432	5 184	1 152	714						18 444	15 964
1991	948		1 318	476	1 821	2 097	586	514					7 760	11 867
1992	655		1 399		3 479	577							6 110	11 922
1993	1 289	94	4 916	260	3 890	915	1 124			25	35	5	12 553	10 064
1994	3 601		7 683	69	6 890	669						35	18 947	17 074
1995	2 878		4 686	592	3 448	971				34			12 609	10 514
1996	313		1 354	87	2 970	758							5 482	14 810
1997	325		2 694	290	3 029	442							6 780	12 314
1998	982	1 215	6 704	326	2 400	310					76		12 013	17 188
1999 ²	2 215		4 642	120	2 836	43	285						10 144	12 196
2000	308		726	601	1 096	61							3 140	11 596
2001	520		806	108	1 549								2 983	13 095
2002	1 951	158	922	72	2 314	70				42			5 529	18 309
2003	706		1 588	15	636	349							3 294	40 208
2004	216		1 821		1 940	458							4 435	34 643
2005	1 637		731	108	176	117							2 769	26 920
2006	272		1 131	104	1 158								2 665	32 031
2007	86	212	741	131	1 068	202							2 440	37 003
2008	496		1 336	58	2 118	624							4 632	40 382
2009			275		156	270							701	33 922
2010	1 697		1 284	700	904								4 585	22 675
2011	1 792		1 102		1 113	126							4 133	35 676
2012			954	992	874	444				120	110		3 494	35 708

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska)

²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and S. M. Olson and R. E. Trost 2013 (USFWS, US data)

Table 12. Greater Snow Goose harvest estimates in Canada and the United States

*An unknown proportion of the U.S. harvest is comprised of Lesser Snow Geese
(harvest estimates of Snow Geese are combined in the U.S.).*

	Maritimes	QC	ON/estern and Northern Canada	Total	U.S. ¹	Continental
					Total	Total
1975		32 436	153	32 589	9 200	41 789
1976		28 866	66	28 932	12 100	41 032
1977			0		22 200	22 200
1978		42 763	1 312	44 687	20 100	64 787
1979		23 190	0	23 190	28 000	51 190
1980		59 120	103	59 223	27 300	86 523
1981	33	27 475	107	27 615	13 500	41 115
1982	50	40 697	832	42 084	21 700	63 784
1983			0		40 400	40 400
1984	177	45 538	624	46 339	37 600	83 939
1985		24 660	0	24 660	14 800	39 460
1986	55	11 077	0	11 132	8 900	20 032
1987		2 125	0	2 125	28 500	30 625
1988		41 827	88	41 915	24 900	66 815
1989		44 185	253	44 438	17 100	61 538
1990	294	59 223	205	59 722	21 500	81 222
1991		48 568	621	49 189	26 400	75 589
1992	295	26 988	926	28 110	10 400	38 510
1993		97 539	429	97 968	30 400	128 368
1994		35 903	112	36 015	17 600	53 615
1995	21	50 267	252	50 540	18 800	69 340
1996	1 981	66 111	111	66 303	31 400	97 703
1997		55 056	164	55 220	34 700	89 920
1998	502	86 791	64	87 157	110 900	198 057
1999 ²	774	36 821	105	37 699	39 100	76 799
2000		103 615	888	104 503	47 000	151 503
2001		94 011	68	94 079	77 802	171 881
2002	225	45 890	751	46 866	39 295	86 161
2003		86 028	111	86 139	35 067	121 206
2004	433	66 326	1 394	67 753	31 548	99 301
2005		66 238	0	66 238	35 394	101 632
2006	135	73 585	331	74 051	33 256	107 307
2007	578	61 652	0	62 230	50 742	112 972
2008	284	114 776	51	115 107	58 752	173 859
2009	257	50 535	661	51 453	29 426	80 879
2010		52 606	301	52 907	18 293	71 200
2011		96 144	2 836	98 980	37 592	136 572
2012		66 858	0	66 858	41 251	108 109

¹AF: Atlantic Flyway.

²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data); R. V. Raftovich and Wilkins 2013 (USFWS, US data)

Table 13. Lesser Snow Goose harvest estimates for Canada and the United States

In the U.S., an unknown proportion of Lesser Snow Geese are also harvested in the Atlantic Flyway and are included with the Greater Snow Goose estimates (Table 12).

	Canada								United States ¹ (PF includes Alaska)				Continental	
	Maritimes	QC	ON	MB	SK	AB	BC	NT/NU/YK	Total	MF	CF	PF	Total	Total
1975		6 545	18 075	51 180	13 159	14 911	2 625	324	106 495	167 700	350 057	92 871	610 628	717 123
1976		234	11 963	31 603	21 269	31 027	2 131	260	98 227	102 500	256 490	144 011	503 001	601 228
1977		20 695	7 012	31 006	13 061	29 709	508		101 991	126 800	306 302	81 841	514 943	616 934
1978	76	519	6 577	39 766	11 582	16 517	394		75 431	133 900	189 015	30 925	353 840	429 271
1979		5 300	9 898	98 426	13 276	11 399	1 944	552	140 243	165 600	338 391	32 628	536 619	676 862
1980	62	12 294	8 276	90 882	16 241	9 451	1 628		138 834	144 600	251 765	35 766	432 131	570 965
1981		593	6 734	87 996	14 947	14 065	3 055		127 390	110 900	289 869	61 109	461 878	589 268
1982		1 632	3 027	81 900	22 229	6 094	1 896		116 778	124 200	241 744	33 074	399 018	515 796
1983		46 188	1 502	81 880	32 584	6 932			169 086	187 300	245 748	46 829	479 877	648 963
1984		2 578	1 097	76 630	32 340	8 791	2 704		124 140	101 800	292 798	64 426	459 024	583 164
1985	50	390	2 010	103 348	33 698	11 768	4 096		155 360	99 200	216 868	82 223	398 291	553 651
1986			2 169	48 950	31 326	9 629			92 074	69 700	149 889	37 384	256 973	349 047
1987		37 803	4 845	69 524	23 320	4 091	2 122		141 705	56 400	182 585	38 236	277 221	418 926
1988		3 952	2 313	71 322	24 204	9 664	1 657		113 112	51 700	251 836	42 134	345 670	458 782
1989		1 183	5 609	92 892	26 752	11 020	917		138 373	97 300	286 271	32 955	416 526	554 899
1990	452	2 228	2 834	53 754	31 818	10 179	141	746	101 813	92 900	211 758	26 802	331 460	433 273
1991		2 710	2 819	65 871	22 407	5 510	2 642		101 959	110 900	249 950	30 999	391 849	493 808
1992	56	591	589	26 786	21 240	9 123	467		58 852	60 100	149 484	29 281	238 865	297 717
1993		7 649	2 543	51 314	19 674	5 304	2 094		88 578	71 800	270 235	55 293	397 328	485 906
1994		5 855	657	56 221	30 258	6 987	2 174	105	102 152	99 100	270 502	29 410	399 012	501 164
1995		855	1 286	61 603	31 323	8 680	1 589	306	105 336	191 200	331 957	37 807	560 964	666 300
1996		3 486	1 028	46 163	34 546	4 185	2 863		92 271	231 100	299 215	59 042	589 357	681 628
1997		8 853	336	69 683	62 635	9 261			150 768	239 000	348 989	35 501	623 490	774 258
1998	16	16 732	954	52 121	68 985	14 890	1 797		155 495	394 700	295 774	52 395	742 869	898 364
1999 ²		6 747	115	14 150	116 313	15 416	1 990		154 731	317 412	487 753	51 190	856 355	1011 086
2000		5 686	1 350	31 699	68 377	12 881	2 559	128	122 680	234 699	380 158	39 039	653 896	776 576
2001		4 427	982	25 335	100 525	13 367	2 354		146 990	315 508	345 139	44 572	705 219	852 209
2002		2 699	697	24 252	85 933	9 612	7 284		130 477	197 297	268 572	46 526	512 395	642 872
2003		3 941	901	26 970	108 457	10 539	1 312		152 120	286 279	247 659	42 931	576 869	728 989
2004		82	642	23 158	76 709	3 654	1 188		105 433	192 256	216 089	40 724	449 069	554 502
2005		1 090	383	13 669	81 946	6 490	2 443		106 021	248 951	304 040	63 779	616 770	722 791
2006	131	1 349	1 122	31 936	116 278	11 430	3 170		165 416	213 274	255 995	71 479	540 748	706 164
2007		703	254	19 452	66 934	14 976	4 626		106 945	148 944	275 228	87 821	511 993	618 938
2008		1 678	70	31 601	112 986	9 570	2 406		158 311	168 482	240 597	87 274	496 353	654 664
2009		730	311	9 123	80 753	11 613	1 316		103 846	109 213	148 768	54 134	312 115	415 961
2010		1 377	422	11 854	78 415	15 162	983		108 213	82 934	153 759	65 034	301 727	409 940
2011		852	198	12 899	85 848	14 970			114 767	122 573	169 145	64 115	355 833	470 600
2012		1 899	1 061	10 864	95 611	7 287	2 110		118 832	103 208	170 381	70 214	343 803	462 635

¹AF: MF, Mississippi Flyway; CF, Central Flyway; PF, Pacific Flyway (including Alaska)

²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and R.V. Rafterovich and Wilkins 2013 (USFWS, US data)

Table 14. White-fronted Goose harvest estimates in Canada and the United States

	Canada														U.S. ¹	Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total	Total	
1974														86 317	86 317	
1975			281				451	45 687	14 345	389	122	142	61 295	115 388	176 683	
1976							825	51 876	9 300			45	62 046	101 217	163 263	
1977								43 341	15 862	82		2	59 287	103 380	162 667	
1978							379	50 987	11 343	246		121	63 076	115 576	178 652	
1979							101	47 200	12 092	72		247	59 712	108 169	167 881	
1980							2 309	56 164	20 037	61			78 571	123 960	202 531	
1981							1 505	36 781	14 648	303		5	53 242	198 608	251 850	
1982							263	39 822	15 435				55 520	131 696	187 216	
1983							119	46 947	5 634		570		52 700	130 868	183 568	
1984						153	115	38 797	14 367	126		37	53 595	153 730	207 325	
1985								37 605	12 482	277			50 364	114 033	164 397	
1986					23		497	37 753	20 598				58 871	76 743	135 614	
1987							125	36 856	11 184	84			48 249	98 126	146 375	
1988								21 643	18 125	102			39 870	101 908	141 778	
1989			43			45	119	34 374	18 738	48			53 367	139 596	192 963	
1990	294						111	26 849	16 525	117	97		43 896	151 608	195 504	
1991			51		82		549	31 649	11 540	65			43 936	138 367	182 303	
1992							623	22 099	8 651	24			31 397	109 926	141 323	
1993			50			171		21 822	7 016				29 059	120 669	149 728	
1994								30 199	9 606	81			39 886	163 602	203 488	
1995							79	45 011	14 888	42		64	60 084	143 003	203 087	
1996			252			69	524	57 676	17 939	138			76 998	214 517	291 515	
1997					180		296	37 326	15 009			37	52 848	209 518	262 366	
1998							1 046	51 204	26 671	242			79 163	185 319	264 482	
1999 ²								47 316	15 033				62 349	254 902	317 251	
2000								86 587	19 964	187			106 738	307 972	414 710	
2001								61 391	31 722	81			93 194	229 673	322 867	
2002							1 048	39 870	10 691			6	51 615	219 317	270 932	
2003						101		49 733	15 348	86			65 268	216 781	282 049	
2004							238	54 419	9 956				64 613	182 507	247 120	
2005							172	55 315	19 947	130			75 564	251 786	327 350	
2006					51			36 967	17 892	273			55 183	282 487	337 670	
2007							992	42 467	26 300	199			69 958	352 362	422 320	
2008							139	55 647	37 893	183			93 862	319 332	413 194	
2009								30 882	22 173	158			53 213	205 244	258 457	
2010					121			33 746	22 144	188			56 199	268 759	324 958	
2011							630	52 762	27 650				81 042	234 808	315 850	
2012							781	36 128	21 861	700			59 470	210 220	269 690	

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska).²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and R. V. Raftovich and Wilkins 2013 (USFWS, US data)

Table 15. Canada and Cackling Goose harvest estimates (all populations combined) in Canada and the United States

	Canada												U.S. ¹		Continental
	NF	PE	NS	NB	QC	ON	MB	SK	AB	BC	NT/NU	YT	Total	Total	Total
1974													0	949 249	949 249
1975	8 185	6 407	9 140	2 872	14 126	31 525	97 586	95 037	83 734	9 423			142 358 177	1 042 411	1 400 588
1976	8 443	17 949	11 192	6 087	24 322	37 216	65 993	71 148	67 533	7 159	52	163 317 205	1 051 936	1 369 141	
1977	12 578	18 788	8 693	2 179	51 269	58 611	45 426	65 402	60 894	9 088	218	127 333 055	1 167 580	1 500 635	
1978	12 743	11 987	6 707	3 239	65 536	53 563	83 152	70 254	77 226	10 837		325 395 569	1 206 509	1 602 078	
1979	13 494	10 827	5 830	2 141	50 816	64 036	95 291	80 354	80 252	13 337		289 416 667	995 336	1 412 003	
1980	10 242	19 137	8 219	2 854	49 377	74 352	74 517	93 609	100 652	16 763	497	525 450 247	1 166 301	1 616 548	
1981	10 170	14 264	7 494	3 911	21 578	50 380	57 956	83 421	95 509	16 052		234 360 969	1 039 450	1 400 419	
1982	11 186	13 296	5 378	2 817	25 897	69 234	74 265	86 257	94 170	13 696		396 196	1 093 911	1 490 107	
1983	13 653	15 780	9 657	7 376	34 984	69 997	72 578	124 109	106 144	14 877		397 469 552	1 243 425	1 712 977	
1984	13 995	13 962	6 508	3 048	22 379	63 612	88 937	94 123	97 422	15 835		270 420 091	1 154 514	1 574 605	
1985	9 886	17 226	6 911	3 958	28 004	76 399	106 352	87 182	101 925	14 559		96 452 498	1 187 431	1 639 929	
1986	16 829	21 970	8 785	5 677	38 877	85 310	92 206	81 626	121 504	14 836		190 453 834	1 110 912	1 564 746	
1987	12 509	21 387	10 942	3 015	57 761	88 450	79 557	102 562	115 355	15 030	550	165 506 733	1 039 969	1 546 702	
1988	9 380	24 906	9 671	3 374	19 922	76 755	56 679	79 879	99 787	15 146		174 395 673	1 119 116	1 514 789	
1989	8 845	23 144	15 666	6 617	55 285	101 618	78 471	84 848	119 082	16 427	367	510 003	1 321 128	1 831 131	
1990	6 521	25 207	6 580	7 273	52 350	97 514	73 822	95 962	121 504	14 831	96	501 564	1 280 150	1 781 714	
1991	5 799	21 459	9 848	5 229	51 837	83 791	72 617	90 821	111 826	18 170	275	510 471 907	1 301 151	1 773 058	
1992	6 436	11 640	4 290	5 350	27 182	79 880	57 464	81 009	91 103	15 961		154 380 469	1 152 108	1 532 577	
1993	9 759	19 168	13 294	6 916	40 593	83 889	73 498	79 823	93 614	13 509		94 434 157	1 428 646	1 862 803	
1994	6 924	28 216	6 935	5 820	15 879	85 233	60 302	82 753	107 925	14 072	21	140 414 199	1 592 634	2 006 833	
1995	9 527	16 967	8 306	5 467	9 560	88 140	49 639	82 155	114 818	11 297		128 396 004	1 638 218	2 034 222	
1996	7 503	22 451	8 758	4 470	10 822	87 781	93 437	111 467	137 440	15 477	417	82 499 688	1 912 588	2 412 276	
1997	5 165	16 769	7 542	6 105	11 748	89 680	107 304	104 934	125 629	14 602		489 478	1 918 433	2 407 911	
1998	9 746	23 781	10 802	6 225	16 882	109 731	94 033	136 736	104 831	18 586		531 353	2 014 378	2 545 731	
1999 ²	5 464	32 944	12 633	6 079	38 702	100 751	68 822	146 112	137 527	16 093	25	90 565 217	1 883 870	2 449 087	
2000	8 223	25 932	13 507	8 418	38 941	125 308	74 632	167 929	132 609	16 544		612 043	2 245 887	2 857 930	
2001	5 553	25 136	10 554	5 615	67 763	148 705	102 034	146 829	111 751	13 076		637 016	2 462 847	3 089 863	
2002	6 744	22 126	10 831	4 962	87 177	160 474	108 306	125 588	108 758	10 459		239 645 664	2 480 441	3 126 105	
2003	5 004	20 983	4 915	11 245	112 807	160 197	90 183	135 123	116 844	14 353		671 654	2 855 575	3 527 229	
2004	4 481	15 028	5 996	6 100	75 316	148 893	92 512	135 759	134 551	8 165		626 801	2 443 344	3 070 145	
2005	5 516	16 109	5 240	6 908	104 530	155 746	118 570	139 194	148 589	11 640		712 042	2 655 730	3 367 772	
2006	4 364	11 245	4 769	6 940	79 569	174 538	105 039	157 414	124 785	9 348		678 011	2 645 665	3 323 676	
2007	5 848	13 586	7 544	9 098	100 811	179 459	97 069	169 206	110 830	9 892		514 703 857	2 676 194	3 380 051	
2008	6 871	16 468	10 040	9 916	114 167	194 293	91 804	155 728	125 624	10 642		735 553	2 844 840	3 580 393	
2009	4 025	11 926	9 056	9 638	126 678	190 433	99 955	140 922	102 591	15 873		116 711 213	2 705 672	3 416 885	
2010	4 336	15 618	12 651	10 641	122 436	170 886	88 963	150 150	104 970	10 511		691 162	2 535 270	3 226 432	
2011	4 118	14 970	7 719	11 475	119 596	199 396	86 956	173 045	98 639	14 402		730 316	2 185 054	2 915 370	
2012	6 499	16 605	8 732	10 196	125 578	179 138	101 055	178 544	98 183	16 356		740 886	2 510 053	3 250 939	

¹AF: Atlantic Flyway, MF: Mississippi Flyway, CF: Central Flyway, PF: Pacific Flyway (including Alaska)²The USFWS implemented an improved national harvest survey in 1999. The results for years prior to 1999 are not directly comparable to those from 1999 onward.

Data sources: M. Gendron and A. Smith 2013 (CWS, Canadian data), and R. V. Ratovich and Wilkins 2013 (USFWS, US data)

APPENDIX D – LIST OF ACRONYMS

AP	Atlantic Population of Canada Goose
BBS	Breeding Bird Survey
COSEWIC	Committee on the Status of Endangered Wildlife in Canada
CWS	Canadian Wildlife Service
EPP	Eastern Prairie Population of Canada Goose
GPP	Great Plains Population of Canada Goose
HLP	Hi-Line Population of Canada Goose
ISR	Inuvialuit Settlement Region
MSS	Mineral Site Survey
MVP	Mississippi Valley Population of Canada Goose
NAP	North Atlantic Population of Canada Goose
NAWMP	North American Waterfowl Management Plan
OMNR	Ontario Ministry of Natural Resources
PP	Pacific Population of Canada Goose
PWGSC	Public Works and Government Services of Canada
RMP	Rocky Mountain Population of Canada Goose
SCWDS	Southeast Cooperative Wildlife Disease Study
SDJV	Sea Duck Joint Venture
SGPP	Short-grass Prairie Population of Canada/Cackling Goose
SJBP	Southern James Bay Population of Canada Goose
TGPP	Tall Grass Prairie Population of Cackling Goose
USFWS	U.S. Fish and Wildlife Service
WBPHS	Waterfowl Breeding Population and Habitat Survey
WPP	Western Prairie Population of Canada Goose

www.ec.gc.ca

Additional information can be obtained at:

Environment Canada

Inquiry Centre

10 Wellington Street, 23rd Floor

Gatineau QC K1A 0H3

Telephone: 1-800-668-6767 (in Canada only) or 819-997-2800

Fax: 819-994-1412

TTY: 819-994-0736

Email: enviroinfo@ec.gc.ca